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CONVAIR | ASTRONAUTICS

CONVAIR DIVISION OF GENERAL DYNAMICS CORPORATION

WS-107A-1

INSTRUMENTATION CONFIGURATION

SERIES D ARTICLE 24

SYCAMORE TEST STAND S-2

ADDENDUM TO AZB-27-008

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Instrumentation Configuration Report

AZB-27-002-24

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REVISIONS

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FORWORD

This report presents tabulations of the functions to be measured via direct line instrumentation for the series "D" Captive Test Missile D-24, ~~Sycamore Test Stand S-2.~~ The tabulations are to be used by Instrumentation Design, Operations, and Data Reduction Groups to determine instrumentation, data handling, and data reduction requirements.

The measurements contained in this report comprise Convair Astronautics and Associated Contractor data requirements as evaluated on 11 September, 1959. Information contained in this report reflects current planning. Measurements have been modified, added, or deleted as dictated by current planning, philosophy and missile configuration. Measurement characteristics have been examined and readjusted where necessary, by the original requesting groups. Further measurement modification will either originate in the Test Planning Group or be submitted as a recommendation to this group. (A)

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LIST OF ILLUSTRATIONS

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SUMMARY

The instrumentation program is shown in three sections in this report, the first being a Master Instrumentation Log showing the latest available characteristics of individual measurements. Also included in this tabulation is an FM channelization for all those measurements to be recorded on FM as indicated in the recorder assignment presented in the second section.

The second section indicates the recorder assignment for each measurement for each test block, and lists the code of the test objectives supported by those measurements along with the priorities of the measurements in regard to the various objectives.

The third section contains a grouping of measurements by test objective. The objective header at the top of each grouping and the objective code to the right of each measurement description are utilized to identify the grouping with the test objectives. Detailed descriptions of the test objectives can be found in report AZB-27-008.

Table I summarizes the test objectives to be accomplished on the missile. Tables II and III contain a count of the direct line measurements required for evaluation of missile systems and test operation.

For ease of data reduction and clarity of communication, it has been desirable to standardize pen number assignments for the bulk of the sequence recorder measurements during "D" series captive testing. The standardized pen list is included in this report as Appendix A and measurements included in this list do not appear in the other tabulation sections.

To more explicitly define information in the tabulations, an IBM Code Key is added as Appendix B.

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CONVAIR ASTRONAUTICS

TABLE I

SUMMARY OF TEST OBJECTIVES

DESCRIPTION	CODE
STRUCTURE	
Strain	
Demonstrate Structural Integrity of the Booster Thrust Structure	AD10
Demonstrate Tanks Structural Integrity	AD11
Demonstrate Structural Integrity of the Propellant Feed System	PD26
PROPULSION	
Control Pressure	
Determine Pressurization Regulators Performance Characteristics	FD38
Propellant Feed	
Determine Vernier Feed System Characteristics	PD23
Determine Hydraulic Characteristics of Vernier Start and Feed System	PD33
General Operation	
Determine Characteristics and Transients in the Start System	PD14
Obtain Data on Booster Engine Operating Parameters	PD15
Obtain Data on Vernier Engine Operating Parameters	PD19
Demonstrate Compatibility Between Propulsion System and the Test Facility	PD28
Determine Sustainer Engine Performance Characteristics with Acoustics PU Control	PD37
Thrust	
Determine Thrust Rise Characteristics	PD39
Propellant Utilization	
Determine Capability of Acoustics PU During Closed Loop Operation	UD18
Determine Capability of Convair PU During Closed Loop Operation	UD36

[redacted]

TABLE I (Cont)

DESCRIPTION	CODE
PROPULSION (Cont)	
Propellant Utilization (Cont)	
Obtain Data Performance of Acoustica PU During Open Loop Operation	UD24
Demonstrate LO_2 Tanking Procedures	WD01
Determine Accuracy of the Convair Propellant Loading Control System	WD02
Determine Accuracy of the Acoustica Propellant Loading System	WD05
CONTROL SYSTEM	
Autopilot	
Determine Booster Threshold Response	SD10
Determine Sustainer Threshold Response	SD11
Determine Booster Servo Loop Gain and Linearity	SD12
Determine Sustainer Servo Loop Gain and Linearity	SD13
Determine Booster Servo Loop Frequency Response	SD14
Determine Sustainer Servo Loop Frequency Response	SD15
MISCELLANEOUS SYSTEMS	
Tank Pressurization	
Demonstrate Airborne Pneumatics System Performance Adequacy	FD34
Hydraulic System	
Demonstrate Booster Performance During Peak Conditions and Staging	HD22
Demonstrate Sustainer-Vernier Performance During Peak Conditions	HD23
Demonstrate Satisfactory Hydraulic Power Switchover	HD26
Demonstrate Vernier Hydraulic Adequacy With Program Gimbaling	HD33

TABLE I (Cont)

DESCRIPTION	CODE
MISCELLANEOUS SYSTEMS (Cont)	
Power Supply	
Determine Performance of the Missile Electrical System	ED15
General	
Demonstrate GSE and Operating Procedures Adequacy and Compatibility	LD11
Obtain Data to Determine Effect of Firing Environment on Load Cell Accuracy	LD13
Obtain Data for Evaluation of Take and Restraints	LD15
Establish Missile Handling, Mating and Demating Procedures	MD12
Demonstrate Flight Countdown Procedures Adequacy	MD13
Demonstrate Missile Systems and Test Facilities Compatibility	ND10
Obtain Data on Missile Systems and Associated GSE for Reliability Analysis	OD10

TABLE I

PROBLEM AREA DESIGNATIONS

(Missile Systems)

Missile System Instrumentation		Number of Measurements
STRUCTURE	10000	
Vibration, High Frequency	13000	2
PROPULSION	20000	
Control Pressure	21000	4
Propellant Feed	22000	9
Propellant Flow	23000	18
General Operation	24000	22
Thrust	25000	5
Propellant Utilization	26000	21
	Propulsion Total	79
CONTROL SYSTEM	30000	
Autopilot	31000	
Control Loop	31100	17
GENERAL MISSILE INSTRUMENTATION	40000	
Tank Pressurization	41000	8
Hydraulic System	42000	10
Power Supply	43000	5
	General Total	23
SEQUENCE MEASUREMENTS		15
	GRAND TOTAL	136

TABLE II

PROBLEM AREA DESIGNATIONS

(Test Operations)

Missile System Instrumentation		Number of Measurements
PROPULSION SYSTEM	70000	
Sequencing, Start	72000	4
Cutoff	73000	7
CONTROL SYSTEM	80000	
Test Signals	81000	1
GENERAL INSTRUMENTATION	90000	
General Data	95000	11
SEQUENCE MEASUREMENTS		52
	GRAND TOTAL	75

CONVAIR ASTRONAUTICS

DISCUSSION OF MISSILE PROBLEM AREAS

Missile D-24, the third captive test missile to be tested, will be delivered to the Sycamore Canyon Facility S-2. The captive test program for Missile D-24 will extend over a period of three months, beginning in August 1959. The purpose of these tests is to evaluate D series design changes and to provide data in support of D series flight missiles. Details of the D-24 test program are outlined in Report AZB-27-008.

The instrumentation configuration of this missile has been established as a result of a detailed anlysis of missile problem areas. A general breakdown of missile systems and test operations problem areas are contained in Table II and III. In the analysis of problem areas, consideration was given to the relative status of system development, previous performance records, applicability of data which might be obtained from captive testing, instrumentation and test schedules. Details of the various problem areas and associated instrumentation are summarized in the following paragraphs.

A. Structural

Information will be gathered on the acoustical environment of the B1 Pod, in preparation for the mounting of the AIG package in this area. The unit selected for use in making this measurement is an Altec-Lansing Model 6700 Sound System.

The system is shock-mounted internally to isolate it from mechanical vibrations of up to 8G over a frequency range of 0 to 2KC. A "Free Field" calibration will be furnished by the vendor. Prior to each hot firing, a one point calibration at 140DB will be accomplished by using an input simulator which will be furnished. The information will be recorded on a wide band FM system using a 54KC oscillator deviated ±40%. Data analysis will be accomplished by Convair (San Diego).

B. Propulsion

Propulsion system analysis can be conveniently divided into the problem areas of control pressures, propellant feed, propellant flow, thrust, and propellant utilization. Overall propulsion system performance, reliability, and compatibility with other facility and missile systems are the prime test criteria.

1. Controls Pressure

The controls helium bottle supplies pressure directly to the booster controls manifold, the start and vernier pressurization manifold, and the sustainer gas generator reference regulator. The discharge pressure of the pneumatic regulator incorporated in each manifold is monitored as these regulators are the most sensitive and crucial elements in the system. Similarly, each reference regulator discharge pressure is measured since these regulators control the LO_2 regulators which adjust the LO_2 flow to the gas generators. The LO_2 and fuel start tank ullage pressure measurements reveal if start requirements are satisfied and repressurization of the tanks is accomplished prior to vernier engine solo operation. Finally the gas pressure in the controls helium bottle is monitored to ascertain if there is sufficient supply pressure.

All sustainer engine and gas generator control valves are hydraulically actuated by pressure derived from the sustainer hydraulic system. The hydraulic system pressure is measured as are the positions of the sustainer main LO_2 and fuel valves for performance information.

Aggregate engine operation and additional instrumentation in the propulsion system will aid in determining if the various control valves are performing properly.

2. Propellant Feed

At engine start the LO_2 and fuel start tanks supply propellants to the gas generators which produce hot gas to drive turbines geared to the LO_2 and fuel turbopumps. When the engines bootstrap the turbopumps feed propellants to the gas generators and refill the start tanks.

The hot gas pressure and temperature measurements indicate start and bootstrap operations adequacy, gas generator mixture ratio and performance levels, and failure analysis possibilities

The vernier engine propellant inlet pressures are monitored for orifice and ducting pressure drop and interface information.

The turbopump speeds are instrumented as they are the end parameters of this area and are representative of the overall feed operation.

3. Propellant Flow

During main engine operation, LO_2 and fuel from the missile tanks flow through separate turbopumps, which increase propellant pressures, to each thrust chamber.

The turobpump propellant inlet pressures and temperatures are measured to insure that engine interface requirements are satisfied and sufficient liquid pressure is available to prevent pump cavitation. In addition, the sustainer turbopump LO_2 and fuel discharge pressures measurements yield information on pump operation and efficiency and help determine general engine performance.

The sensitive and accurate turbopump speed instrumentation will respond rapidly to varying pump inlet and outlet conditions. Thus these measurements will reflect turbopump cavitation very quickly.

4. Thrust

Thrust calculations and related transient analysis will be made based on chamber pressure data and engine coefficients obtained during acceptance tests.

5. Propellant Utilization

a. Acoustica PU System

Instrumentation in the Acoustica PU Package has been planned to furnish maximum information by obtaining data on key parameters within the system.

The Acoustica sensor signals indirectly trigger multivibrators controlling a gate between an oscillator and a counter. Thus by monitoring the output of both monostable multivibrators (U1135X) information is obtained on discrete propellant levels, magnitude of propellant error signal, and the direction in which the PU valve should be moved (toward open or closed).

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The counter output is converted to an analog voltage. U1112V "Acoustica Counter Otp" thus verifies the transfer function of the error signal from digital to analog form and, when combined with U1113V "Acoustica V1v Pos Feedback," gives the command signal to the PU valve. Logging of the fuel density bias setting will allow computation of valve position from U1113V.

b. Convair PU System

Two mercury manometers (one manometer measures differential pressure on each tank) act as variable condensers in two legs of the "Convair PU Bridge". The error signal, which is generated by the bridge, is monitored. The data thus gained furnishes information on the residual ratio of the propellants in the tanks and the value of the command signal to the sustainer main fuel valve. The PU valve position measurement also indicates if the PU system is operating properly.

c. Propellant Tanking

The Convair tanking system utilizes a discrete level sensing device for controlling the quantity of fuel placed in the missile. The quantity of LO_2 is controlled by tanking to a null on the PU bridge. Quantity of propellants tanked can be computed based on station levels converted to an equivalent mass. The tolerance in the tanking system will be obtained by comparing this data to corrected load cell data.

The Acoustica system utilizes discrete level sensor in each tank. The load cell data will also furnish information for an evaluation of this system.

C. Control Systems

1. Autopilot

Since the autopilot system has been tested extensively on previous "D" series captive missiles, only the basic input-ouput measurements will be taken. This instrumentation will include a measurement of the servo

test signal, which is utilized in lieu of gyro outputs to gimbal the thrust chambers during captive tests, and measurements of the thrust chamber positions as indicated by the servo system feedback signals.

Although no gyro operation is planned at present, it has proved expeditious in the past to provide gyro instrumentation in preparation for special tests which may be integrated into the program. This instrumentation consists of the displacement gyro outputs.

In addition to the above instrumentation, functional tests of a qualitative nature will be performed through use of the autopilot test console.

2. Radio Guidance System

No emphasis has been placed on captive testing this system on this missile, hence, it will not be installed.

D. General Systems

1. Main Tank Pressurization

During a hot firing of a captive test article the booster tank helium supply bottles are continuously pressurized from the ground supply. The pressure measurement in the booster tank bottles will show that Phase III pressurization requirements are satisfied. Main tank ullage pressures will be monitored for system operating and failure analysis purposes.

An intensive program to test the main tank pressure regulators in a missile environment is scheduled for all D series captive articles. Inlet conditions for both regulators are established by measuring the pressure and temperature of the gas entering the LO_2 tank pressure regulator. The regulator discharge pressures are monitored to verify regulator performance.

2. Hydraulic Systems

There are two independent hydraulic systems on "D" series missiles. One system furnishes hydraulic pressure for booster engine gimbaling prior to staging. The second system furnishes hydraulic pressure for

sustainer and vernier operation. Since the booster and the sustainer hydraulic systems will have been extensively tested on previous series missiles, instrumentation of system pressure and engine position measurements will establish the capability of these systems to perform satisfactorily.

3. Power Supply

Electrical power to the missile will be supplied from the ground during the shorter runs. For the long runs the battery-inverter combination will provide electrical power. The battery normally used on flight missiles, i.e., the manually activated primary battery, has been replaced with a remotely activated battery. Inasmuch as this will not be a change in electrical power supply operation as far as the missile is concerned, only AC frequency, Phase A voltage, and DC voltage will be instrumented in order to indicate that the missile is receiving proper electrical power.

CONVAIR ASTRONAUTICS

UTILIZATION OF THE FM RECORDING SYSTEM

An FM recording system will be utilized to provide an accurate high response recording medium. Manual reduction of data is being largely supplanted by automatic reduction through an electronic processing station operating from a magnetic tape recording of data.

The FM system accepts as inputs balanced and unbalanced voltages with a deviation range of less than 5 volts. These signals are used to modulate subcarrier frequencies which are then mixed together and recorded on magnetic tape. The following table indicates the subcarriers available and the data response capability.

Channel	Center Frequency CPS	Deviation % of Center Frequency	Frequency Response Flat to 2% CPS
5	1,300	± 7.5	0 - 20
6	1,700	± 7.5	0 - 25
7	2,300	± 7.5	0 - 35
8	3,000	± 7.5	0 - 45
9	3,900	± 7.5	0 - 59
10	5,400	± 7.5	0 - 81
11	7,250	± 7.5	0 - 110
12	10,500	± 7.5	0 - 160
13	14,500	± 7.5	0 - 220
A	22,000	± 15	0 - 660
C	40,000	± 15	0 - 1200
E	70,000	± 15	0 - 2160

These subcarriers are mixed six at a time and each group of six is recorded on one track of a magnetic tape. A specific grouping of six has been set up to avoid the possibility of two frequencies adding together to provide a third frequency that exists within another subcarrier band. For convenience of notation we will call the two sets of 6 subcarriers Track A and Track B. Track A contains subcarriers 5, 7, 8, 11, 12, and C; Track B contains subcarriers, 6, 9 10, 13, A, and E. In order to avoid possible cross talk between adjacent tracks on the magnetic tape, these two track types are alternately recorded across the tape.

The FM system has a capability of recording 11 tracks of each track type for a total of 132 measurements. There are two magnetic tape machines each containing a 14 track magnetic tape; eleven tracks of data are recorded on each tape. Track 7 is reserved for timing and speed lock. Voice is recorded on tracks 7 or 14 which are not used for data.

Specific channel assignment has been arrived at by Test Planning based on measurement frequency response requirements and playback capabilities with respect to certain groupings of measurements. High frequency flow meters and tachometer measurements are recorded directly on magnetic tape to avoid overloading to high frequency channels. This is possible since these signals are frequency modulated themselves and may be used as their own subcarriers. The magnetic tape tracks upon which these signals are recorded have no channel 5 or 6 in order to eliminate the possibility of these signals interfering with data on those channels. Hence in the FM channelization listing these signals are shown as being recorded on subcarriers 5 and 6.

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10	5,400	± 7.5	0- 81
11	7,350	± 7.5	0- 110
12	10,500	± 7.5	0- 160
13	14,500	± 7.5	0- 220
A	22,000	±15	0- 660
C	40,000	±15	0-1200
E	70,000	±15	0-2100

These subcarriers are mixed six at a time and each group of six is recorded on one track of a magnetic tape. A specific grouping of six has been set up to avoid the possibility of two frequencies adding together to provide a third frequency that exists within another subcarrier band. For convenience of notation we will call the two sets of 6 subcarriers Track A and Track B. Track A contains subcarriers 5, 7, 8, 11, 12, and C; Track B contains subcarriers, 6, 9, 10, 13, A, and E. In order to avoid possible cross talk between adjacent tracks on the magnetic tape, these two track types are alternately recorded across the tape.

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CONVAIR ASTRONAUTICS

MISCELLANEOUS REQUIREMENTS

1. Closed Circuit Television

Television monitoring of the D-24 Captive Article will be accomplished with the following components of the KIN TEL 1958 Industrial System:

A. Two (2) video cameras:
Video Bandwidth -- 8 mc
Horizontal Resolution -- 600 lines
Linearity -- better than ± 2%

B. Two (2) ARC-10A Heavy Duty Remote Control Pan and Tilt Units:
Pan Range -- 360° @ 3 deg/sec
Title Range -- ± 45° @ 3.5 deg/sec

C. Two (2) ARC-4 Remote Control Turret Lens (1/2", 4", 6") with iris and focus control:
Iris Control Speed -- 5.75 deg/sec
Focus Control Speed -- 0.021 inches/sec

D. Two (2) ACH-2 Weatherproof Housings

E. Two (2) 17" Video Monitors

F. Two (2) Camera Controls with 8"-TV Monitors

The arrangement of this system is covered on sketch titled "SYC-2 CLOSED CIRCUIT TELEVISION."

2. Data Processing and Handling Requirements

Data reduction and analysis will be accomplished in conjunction with Design and Development Personnel. Test results will be compiled and published in the following reports:

A. X+3 Hour Report: Sycamore responsibility. Contains results of quick look inspection performed at the site.

B. X+24 Hour Report: Sycamore & Test Evaluation responsibility. Contains quick information on performance levels of the engines and general operation of the systems, as well as noting any malfunctions which may have occurred during the run. Preliminary test results and conclusions are listed.

C. X+72 Hour Report: Joint responsibility of Sycamore and Test Evaluation Group. Contains more detailed analysis of missile performance and operation. Problems which have occurred will be investigated more closely in this report.

D. Monthly Report: Test Evaluation Group responsibility. To be published each month. Summarizes the test results and test objectives accomplished during tests conducted during the previous month.

E. Summary Report: Test Evaluation Group responsibility. To be published during month subsequent to the completion of the D-24 test program. Includes a detailed analysis of special investigations and missile problem areas, as well as summarizing test results.

In addition to the above tabulated report responsibilities, Test Evaluation Group will furnish STL with copies of all raw autopilot data within three days of a hot firing. Prior to seven days after a test is completed, Test Evaluation will furnish STL and Sycamore with reduced data. Design and Development Groups will be furnished with raw data and reduced data as needed.

3. Operation Visual Panel Presentations

The following tabulation of visual meters has been compiled for information purposes in order to provide a more complete picture of the important monitoring devices which will be available to test personnel in their maintenance of blockhouse test control. In order to differentiate these functions from the 1000 series direct line measurements, a 5000 series designation will apply to these visual panel presentations.

S-2 PANEL METER PRESENTATIONS

MEAS. NO.	DESCRIPTION	MEAS. RANGE	UNITS OF FUNCTION	LOCATION
E5068C	EMERGENCY GENERATOR	0-200	AMP	Facility Power Console
E5066C	MISSILE DC AMPS	0-200	AMP	Missile Power Console
E5005Q	MISSILE INT PHASE A	396-404	CPS	Missile Power Console
E5029Q	MISSILE EXT PHASE A	396-404	CPS	Missile Power Console
E5031Q	PHASE A EXT @ MSL	396-404	CPS	Missile Power Console
E5003V	MISSILE INTERNAL DC	0-40	VDC	Missile Power Console
E5006V	MISSILE INTERNAL AC	110-120	VAC	Missile Power Console
E5022V	MISSILE AC EXT @ MSL	110-120	VAC	Missile Power Console
E5023V	MISSILE EXTERNAL AC	110-120	VAC	Missile Power Console
E5030V	MISSILE DC EXT @ MSL	0-40	VDC	Missile Power Console
E5065V	MISSILE EXTERNAL DC	0-40	VDC	Missile Power Console
E5101V	GROUND DC BUS	0-30	VDC	Engine Test Panel
E5102V	MISSILE DC BUS	0-30	VDC	Engine Test Panel
F5001P	LO_2 TANK HELIUM	0-30	PIG	Pneumatics Console
F5003P	FUEL TANK HELIUM	0-75	PIG	Pneumatics Console
F5032P	LN_2 PRESSURE	0-400	PIG	Pneumatics Console
F5053P	NORM SUP PRESSURE	0-4000	PIG	Pneumatics Console
F5054P	EMERG SUP PRESSURE	0-4000	PIG	Pneumatics Console
F5116P	DIFFERENTIAL PRESSURE	0-5	PID	Pneumatics Console
F5246P	BSTR TANK PRESSURE	0-4000	PIG	Pneumatics Console
F5248P	SUST TANK PRESSURE	0-4000	PIG	Pneumatics Console
F5291P	SUST CONTROL PRESSURE	0-4000	PIG	Pneumatics Console
F5247T	BSTR TANK TEMPERATURE	M80-M380	DGF	Pneumatics Console
F5249T	SUST TANK TEMPERATURE	M80-M380	DGF	Pneumatics Console
F5250T	SUST CONTROL TEMPERATURE	M100-200	DGF	Pneumatics Console
L5006D	MISSILE ALIGNMENT	M50-50	MIN. OF ARC	Holddown and Release Safety Console

S-2 PANEL METER PRESENTATIONS (Cont)

MEAS. NO.	DESCRIPTION	MEAS. RANGE	UNITS OF FUNCTION	LOCATION
P5242B	PUMP LC SPEED	0-100	PCT	LO_2 Tanking Console
P5251D	LC THROTTLE VALVE	0-Full		LO_2 Tanking Console
P5373P	LO_2 STORAGE TANK	0-50	PIG	LO_2 Tanking Console
U5091V	LO_2 TANK LEVEL INDICATOR	80-105	PCT	LO_2 Tanking Console
P5685M	FUEL IN MISSILE	K-100	GAL	Fuel Tanking Console
P5430P	FUEL STORAGE TANK	0-50	PIG	Fuel Tanking Console
Q5007D	THROTTLE POSITION	0-100	PCT	Flame Deflector Console
Q5008P	VERNIER DEFLECTOR	0-25	PIG	Flame Deflector Console
Q5009P	MAIN DEFLECTOR	0-300	PIG	Flame Deflector Console
Q5002R	MAIN DEFLECTOR FLOW	0-35000	GPM	Flame Deflector Console
Q5010P	FIREX PRESSURE	0-300	PIG	Firex Console
S5281C	PANEL POWER SUPPLY	0-400	MA	Autopilot Monitor Control
S5270V	FINE HEATER-PITCH	0-150	VAC	Autopilot Monitor Console
S5271V	FINE HEATER-YAW	0-150	VAC	Autopilot Monitor Console
S5272V	FINE HEATER-ROLL	0-150	VAC	Autopilot Monitor Console
S5260V	PANEL POWER SUPPLY	0-300	VDC	Autopilot Monitor Control
S5282W	DECADE EVENT TIMER	0-99999	SEC	Autopilot Monitor Console
S5176W	PROGRAM RUN TIME	0-999	SEC	Autopilot Control Console

4. Pneumatic System Validation

Validation of the tank pressure regulators follows rigorous laboratory flight certification procedures. Thus the characteristics of these regulators will already be well known and site checkout and validation will serve simply to confirm this prior knowledge.

The checkout will establish the following points:

a. Cutoff pressures of the regulators.

b. Regulator performance (at ambient temperatures) during simulated engine operation and

c. Regulator response to shutdown.

Measurements required are:

P3301P GROUND LO_2 ULLAGE TANK PRESSURE
P3302P GROUND FUEL ULLAGE TANK PRESSURE

5. Load Cells

The "load cells," which consist of four strain gauge transducer outputs combined into one measurement, sense the weight of the launcher, missile, missile propellants, and any other masses supported by the launcher. On Missile D-24 a "secondary standard" for calibrating these load cells and associated read out equipment will be available. This instrumentation will aid in determining the tolerance in propellant mass when tanking to a constant level.

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DISCUSSION OF REASONS FOR REVISION "A" CHANGES

The following paragraphs discuss and list the changes in instrumentation for Missile 24-D that have occurred since the original publication of this report.

I. External electrical measurements have been added since ground power will be used throughout the test. These measurements will provide the same data as those normally picked up internally at the load side of the power changeover switch, but external measurements are more convenient to make on this captive missile:

MEAS. NO.	DESCRIPTION
ADD:	
E1029Q	EXTERNAL AC FREQUENCY
E1065V	MISSILE EXTERNAL DC

II. Some difficulty has been encountered with hydraulic pressure switches. The following measurements were added to furnish data in this area:

ADD:	
H1197X	GROUND HYD LO PRESS B
H1196X	GROUND HYD HI PRESS B
H1199X	GROUND HYD HI PRESS S&V
H1200X	GROUND HYD LO PRESS S&V

III. The quantity of propellants placed aboard the missile is a determining factor on missile range. To aid in establishing the tolerance of the Accustica tanking system the following measurements were added:

ADD:	
N1969X	AA 90% FUEL PROBE
N1970X	AA 96% FUEL PROBE
N1971X	AA 99.6% FUEL PROBE
N1972X	AA 100.2% FUEL PROBE
N1973X	AA LO_2 RAPID SIG
N1974X	AA LO_2 SU RAPID SIG
N1975X	AA LO_2 FINE SIG

MEAS. NO.	DESCRIPTION
ADD:	
N1976X	AA LO_2 BU FINE SIG
N1977X	AA LO_2 TOPG COF SIG
N1978X	AA LO_2 EMG SIG
P1682P	PRESS DIFF ON LO_2 TK
P1683P	PRESS DIFF FUEL TANK

IV. High frequency oscillations, in some cases, have occurred in the propulsion system. The measurements below were added to furnish information in this area:

ADD:

P1439O	SUSTAINER NAA ROUGH COMBUSTION CUT-OFF ACCEL
P1452O	B1 NAA ROUGH COMBUSTION CUT-OFF ACCEL
P1453O	B2 NAA ROUGH COMBUSTION CUT-OFF ACCEL

V. In some instances high frequency oscillations have been encountered in the high pressure propellant ducting. The following instrumentation will provide a means to detect and analyze these oscillations as well as yield information toward tracing past malfunctions:

ADD:

P1091P	B1 LO_2 INJ MANIFOLD
P1092P	B2 LO_2 INJ MANIFOLD
P1093P	B1 FUEL INJ MANIFOLD
P1094P	B2 FUEL INJ MANIFOLD
P1250P	S FUEL INJ MANIFOLD

VI. A corrosion problem had been encountered in the main engine thrust chambers when lithium chloride was used in the thrust chamber coolant tubes prior to the starting of the engines. Three insulated temperature transducers were suitably located on the skin of the purge tubes to determine whether temperatures would cause water to freeze in the tubing. The following measurements will furnish data on this area:

MEAS. NO.	DESCRIPTION
ADD:	
P1764T	B1 PURGE LN NEAR BULK-HEAD
P1767T	B1 CHAMBER SKIN TEMP
P1768T	B1 PURGE LN @ ENG MAN

VII. Accoustica furnished equipment and wiring to the E-A recorders was installed in order to monitor Accoustica alternate sensor string operation. Measurements in this area include:

ADD:	
U1148X	LO_2 2 SNSRS STA 497
U1149X	LO_2 2 SNSRS STA 671
U1150X	LO_2 2 SNSRS STA 765
U1151X	LO_2 2 SNSRS STA 838
U1152X	LO_2 2 SNSRS STA 861
U1153X	LO_2 2 SNSRS STA 883
U1160X	FUEL 2 SNSRS STA 944
U1161X	FUEL 2 SNSRS STA 1024
U1162X	FUEL 2 SNSRS STA 1083
U1163X	FUEL 2 SNSRS STA 1126
U1164X	FUEL 2 SNSRS STA 1141
U1165X	FUEL 2 SNSRS STA 1156

VIII. The measurement below has been added so that an accurate determination may be made of the Accoustica PU sensor uncovering time by establishing the time between the sensor uncovering and the present measurement (U1135X):

ADD:	
U1134X	AA TIME SHARED OSC OUTPUT

IX. To further evaluate the Convair propellant tanking system the following measurements were added:

P1311X	90% FUEL LVL IND
P1967X	FUEL OVERFILL

MEAS. NO.	DESCRIPTION
ADD:	
P1988X	LO_2 95% LVL EMER COF
P1997X	MISSILE FUELED 95%
P1998X	LO_2 OVERFILL EMER COF
P1999X	MISSILE FUELED 100%

X. The residual propellants and the ratio of these propellants are indicative of PU performance. The following two measurements were added to furnish information on residual propellants:

ADD:	
U1080P	LO_2 TANK HEAD
U1081P	FUEL TANK HEAD

XI. Additional data is required on gyro noise characteristics. The following instrumentation changes have been made to provide more reliable data:

ADD:	
S1147V	PITCH GYRO AMP OUT
S1148V	YAW GYRO AMP OUT
S1149V	ROLL GYRO AMP OUT
DELETE:	
S1061D	ROLL DISPL GYRO SIG
S1062D	PITCH DISPL GYRO SIG
S1063D	YAW DISPL GYRO SIG

XII. The following measurements were added to provide information on static and coulomb friction of the engine gimbal block:

ADD:	
E1206P	B1 PITCH ACTR EXTEND
E1207P	B1 PITCH ACTR RETRACT
E1208P	B1 YAW ACTR EXTEND

MEAS. NO.	DESCRIPTION
ADD:	
H1209P	B1 YAW ACTR RETRACT
S1252D	B1 YAW
S1253D	B2 YAW
S1254D	B1 PITCH
S1255D	B2 PITCH

XIII. The following instrumentation was added to verify operating procedures and yield failure analysis information:

ADD:	
F1994C	DC TO BOIL-OFF VALVE MOTOR
F1246P	BOOSTER TANK HELIUM BOTTLE H1
F1318T	ST PNEUMATIC REGULATOR IN

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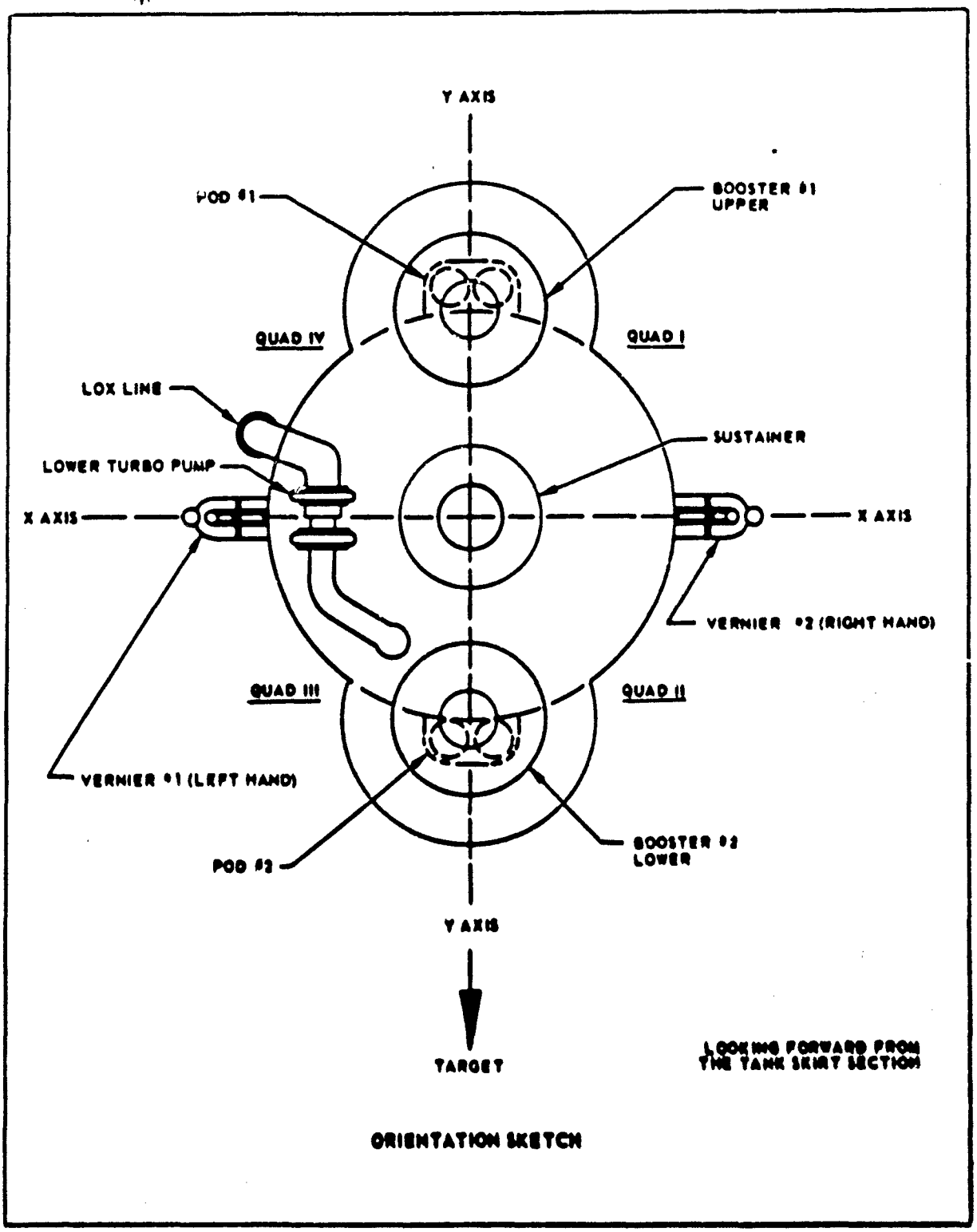
CONVAIR ASTRONAUTICS

ILLUSTRATIONS



ORIENTATION SKETCH

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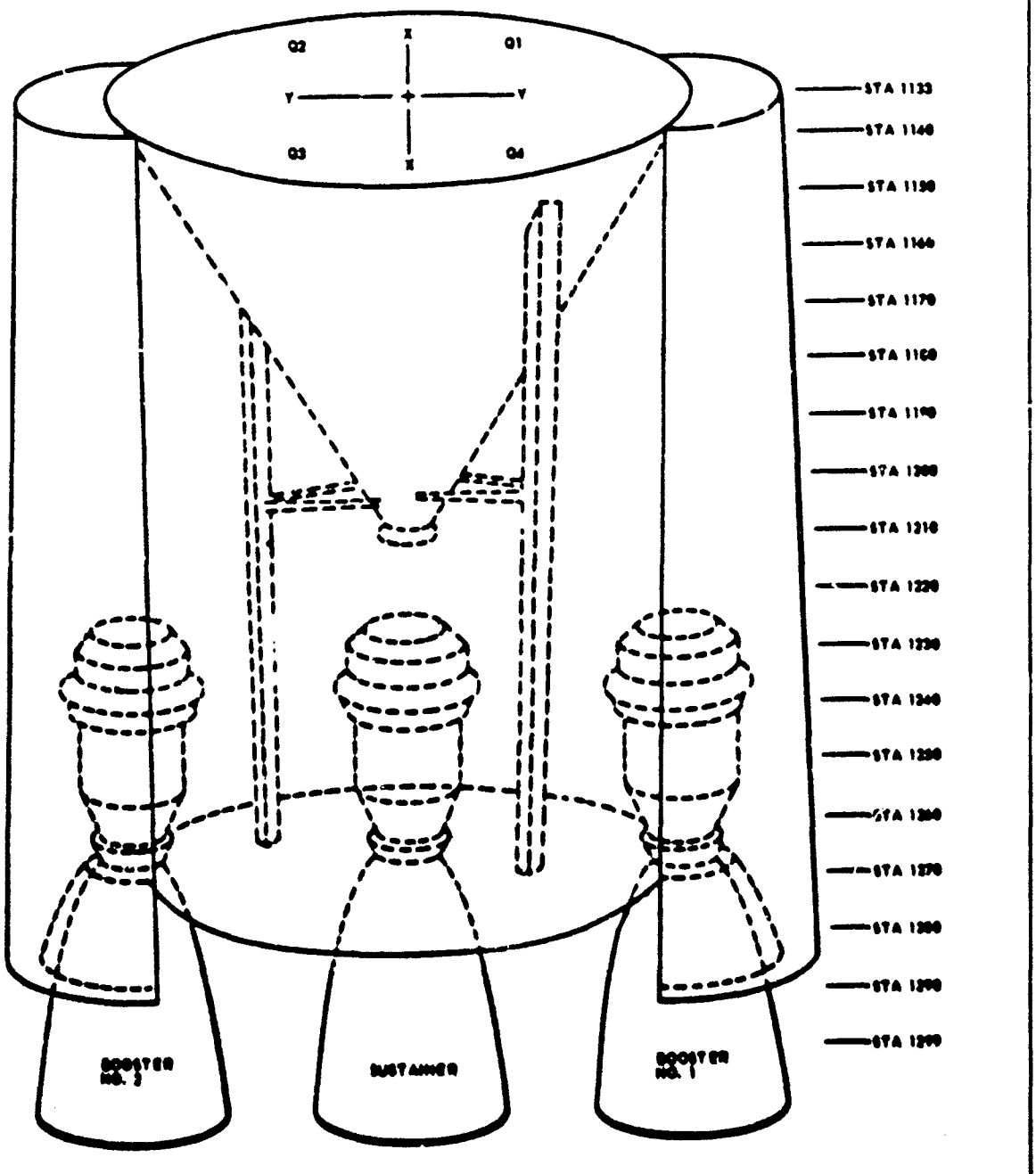

THRUST SECTION

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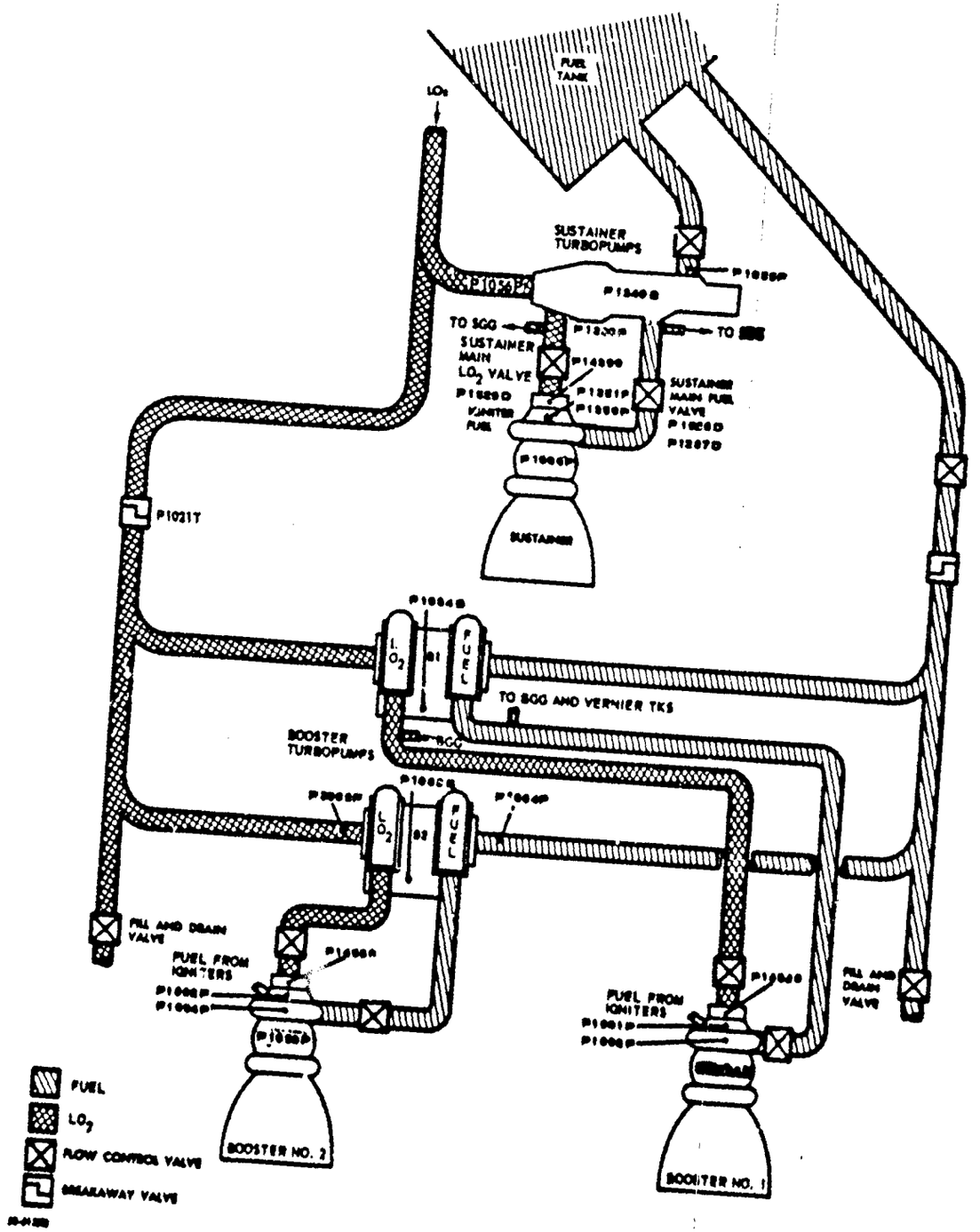
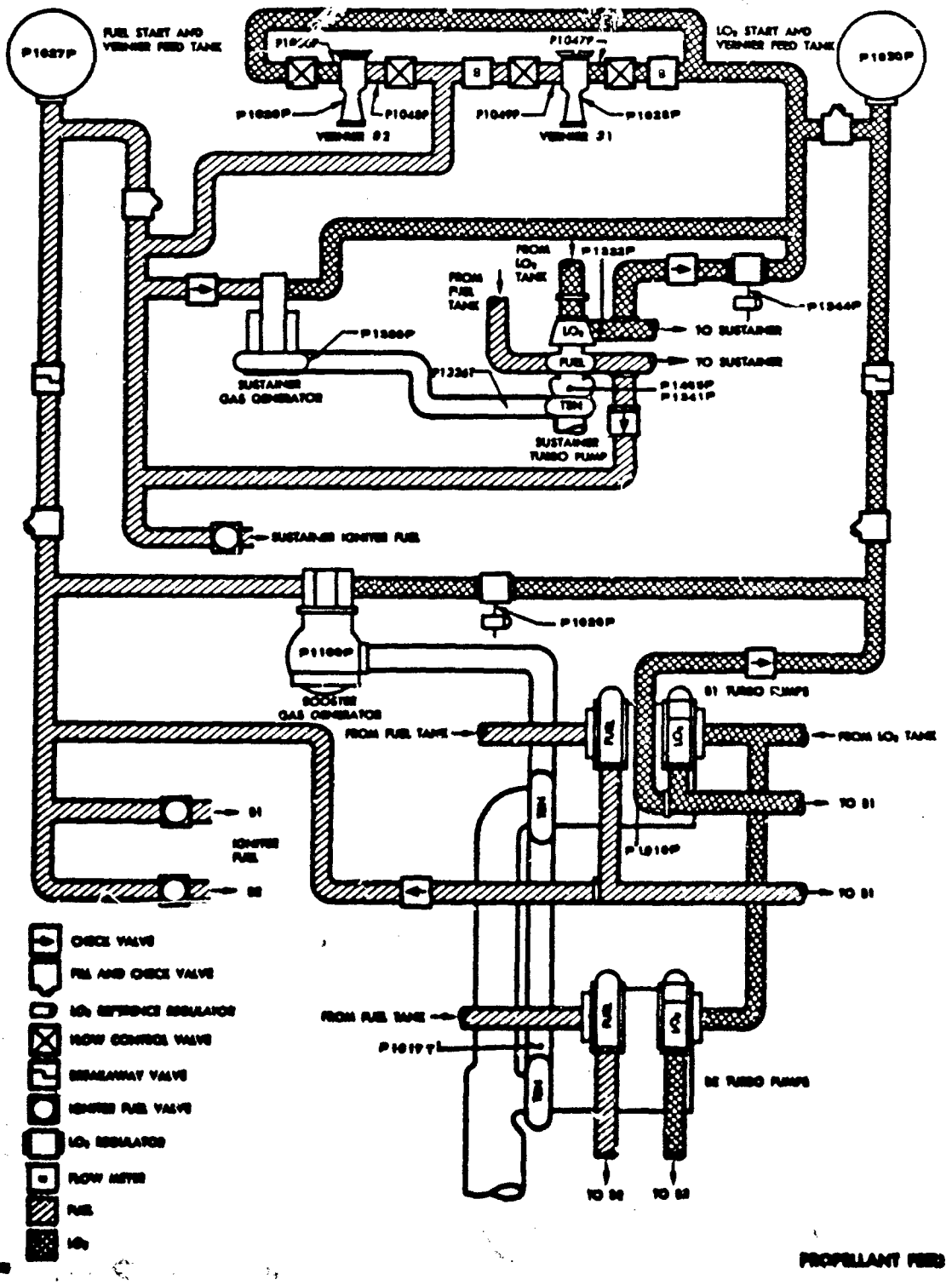
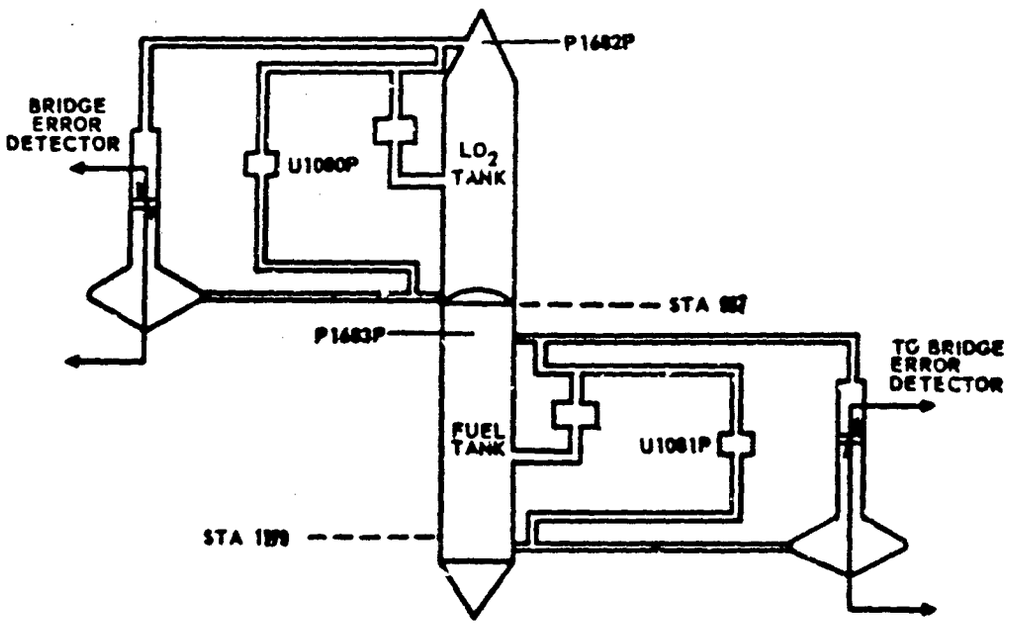
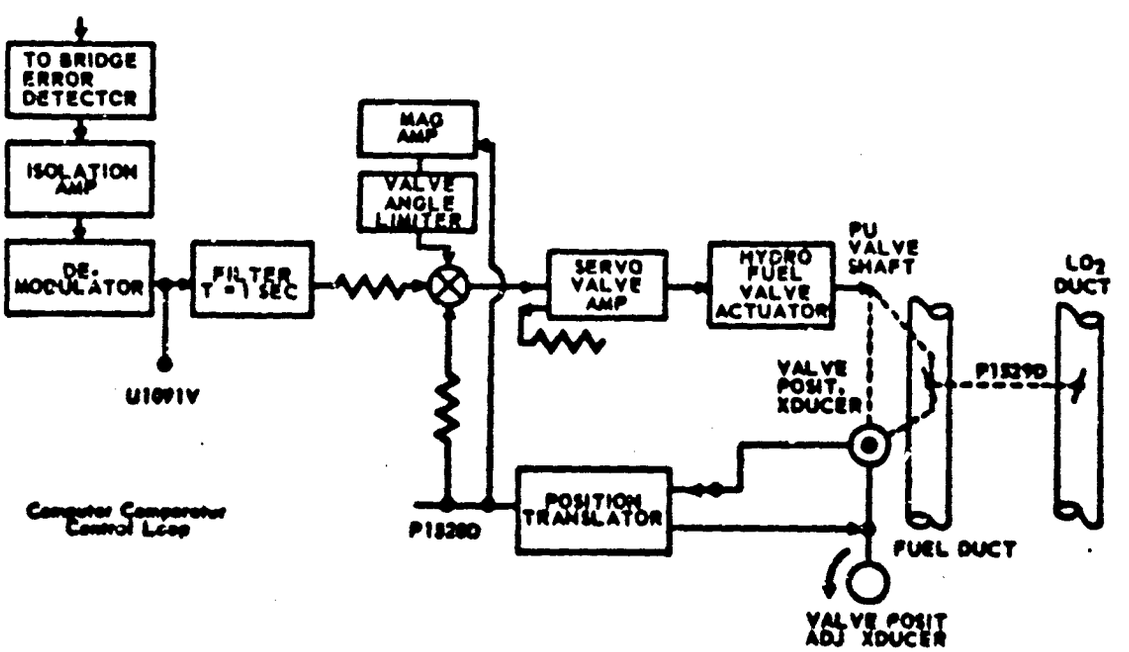


PROPELLANT FLOW

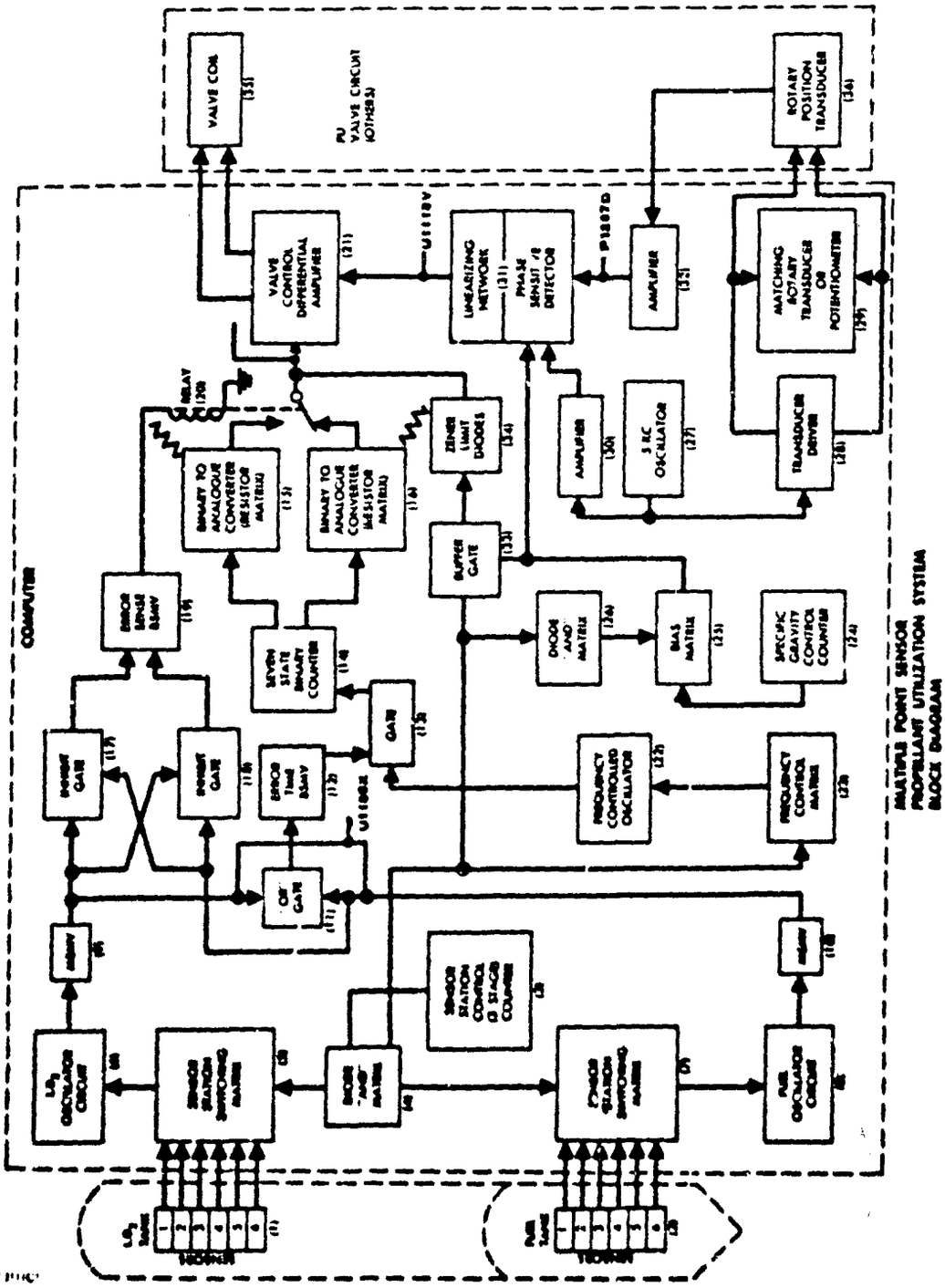
FORM AE555-6

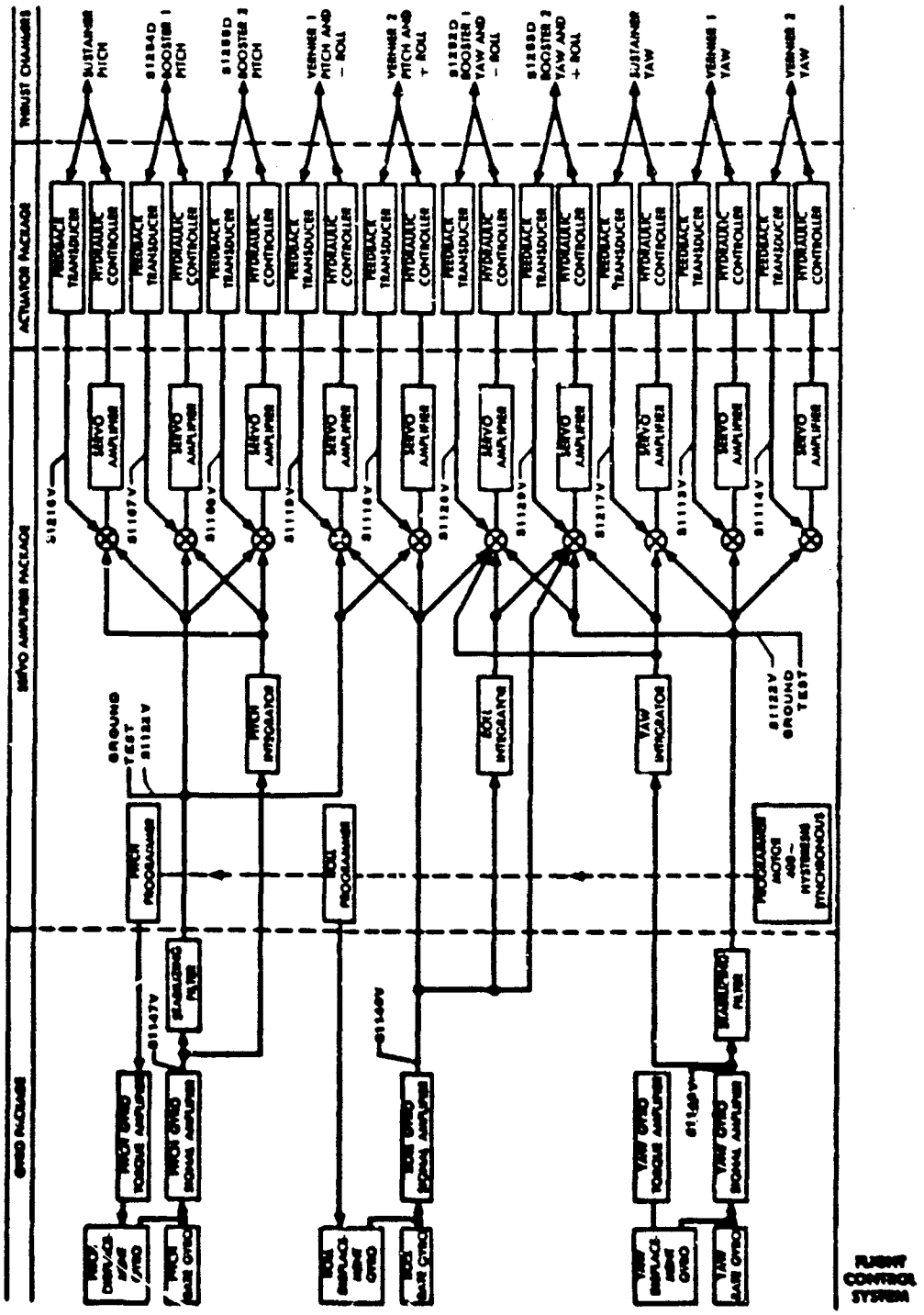

FUEL START AND VERNIER FEED TANK
LO2 START AND VERNIER FEED TANK
P1027P
P1030P
P1047P
P1047P
P1028P
P1048P
P1049P
P1029P
VERNIER #2
VERNIER #1
FROM LO2 TANK
FROM FUEL TANK
P1032P
P1044P
P1060P
TO SUSTAINER
TO SUSTAINER
P1046P
P1341P
P1326P
SUSTAINER GAS GENERATOR
TBN
SUSTAINER TURBO PUMP
SUSTAINER IGNITER FUEL
P1026P
P1100P
BOOSTER GAS GENERATOR
#1 TURBO PUMPS
FROM FUEL TANK
FROM LO2 TANK
TO #1
TO #1
#1 IGNITER FUEL
#1
#2
P1010P
CHECK VALVE
FILL AND CHECK VALVE
LO2 REFERENCE REGULATOR
FLOW CONTROL VALVE
RUNAWAY VALVE
IGNITER FUEL VALVE
LO2 REGULATOR
FLOW METER
FUEL
LO2
FROM FUEL TANK
P1019P
#2 TURBO PUMPS
TO #2
TO #2
PROPELLANT FEED

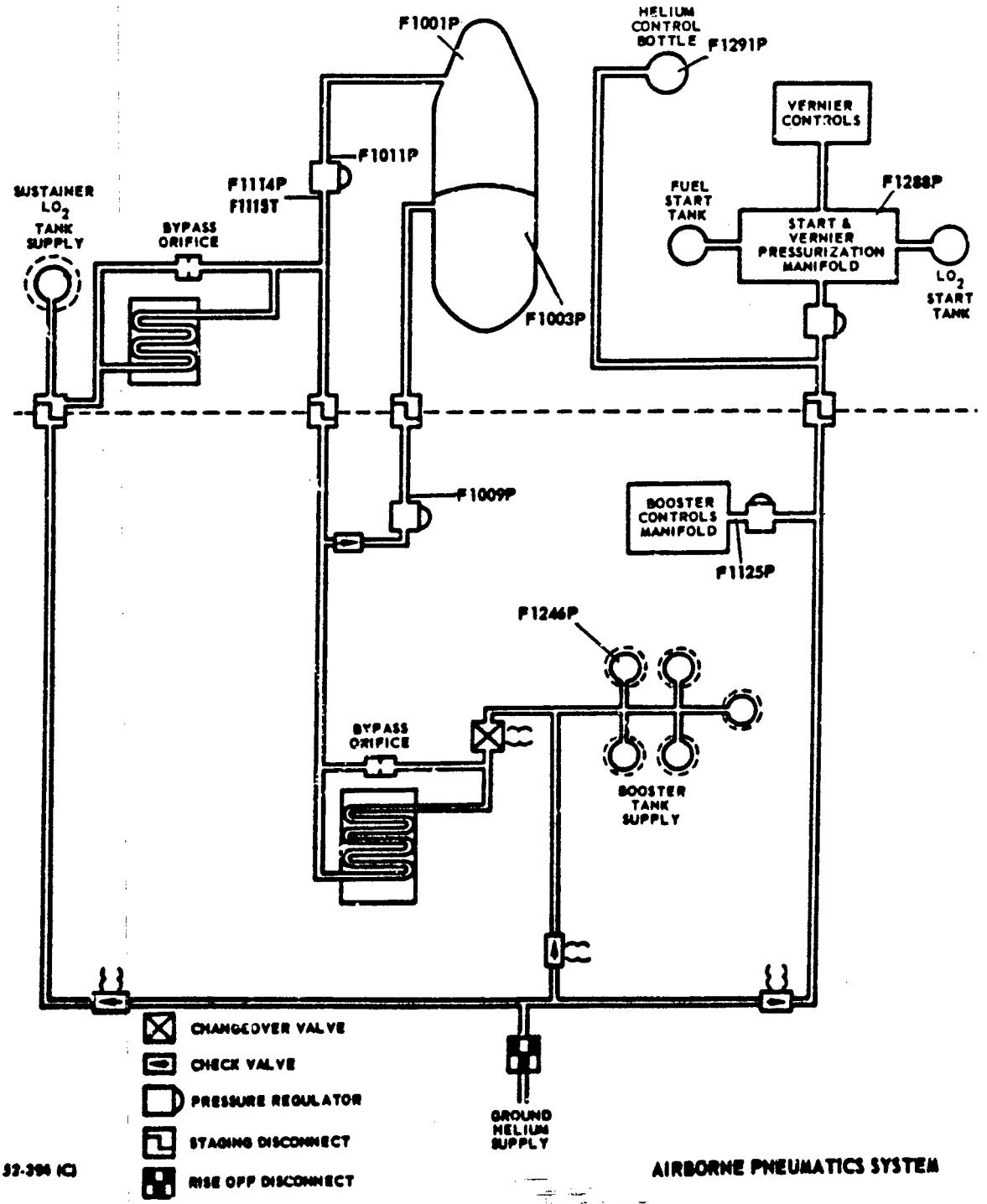




CONVAIR PROPELLANT UTILIZATION SYSTEM

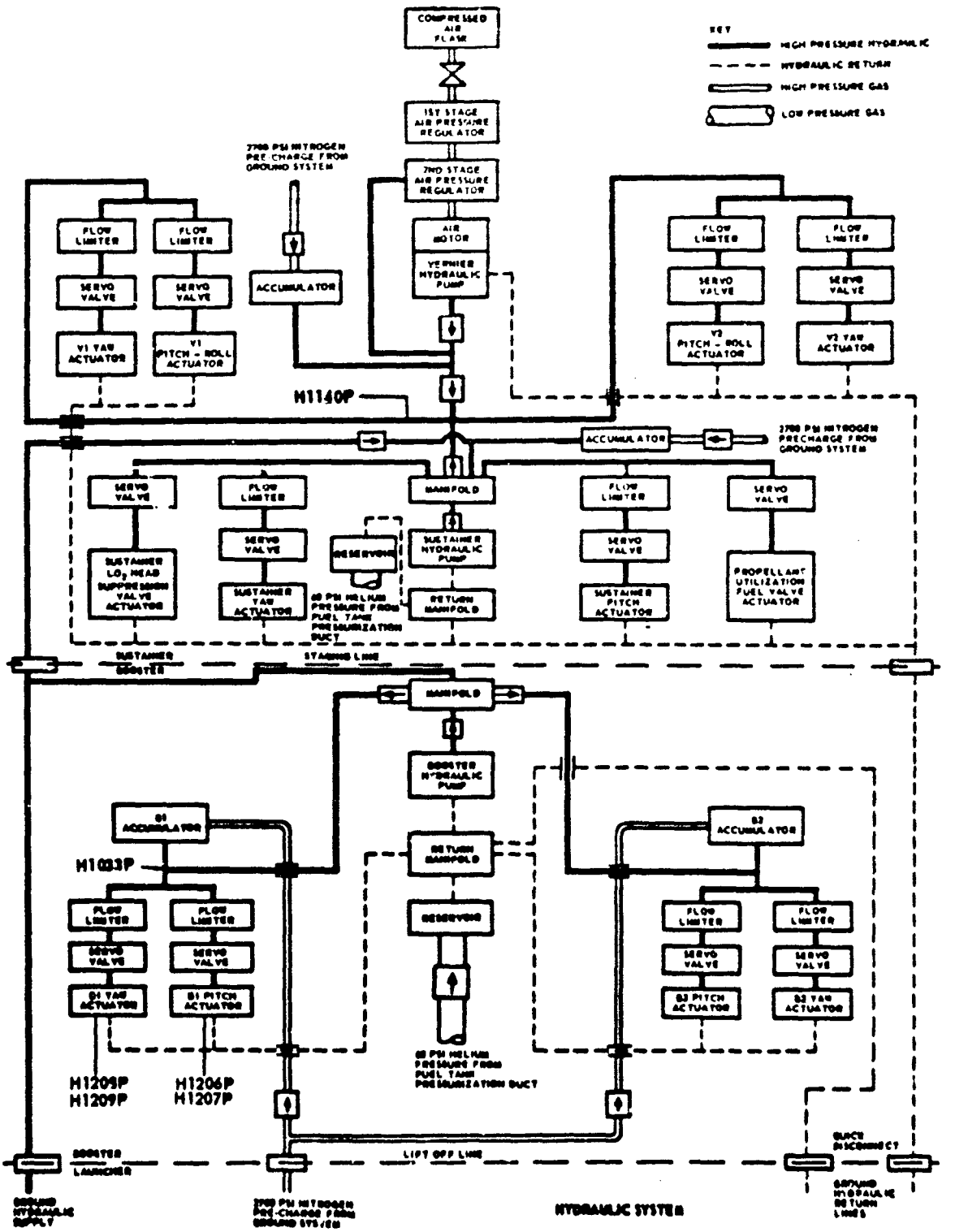


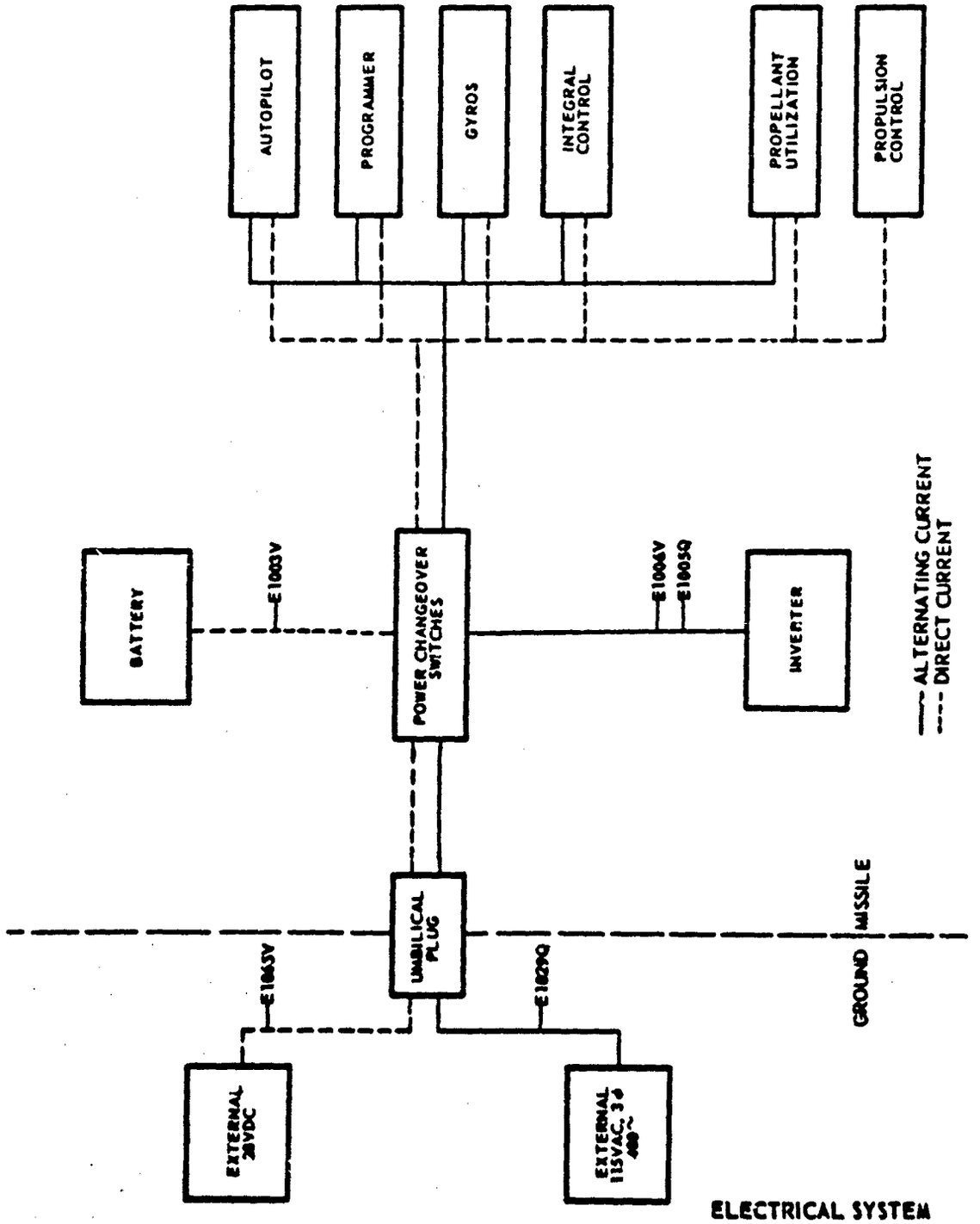




52-394 (C)

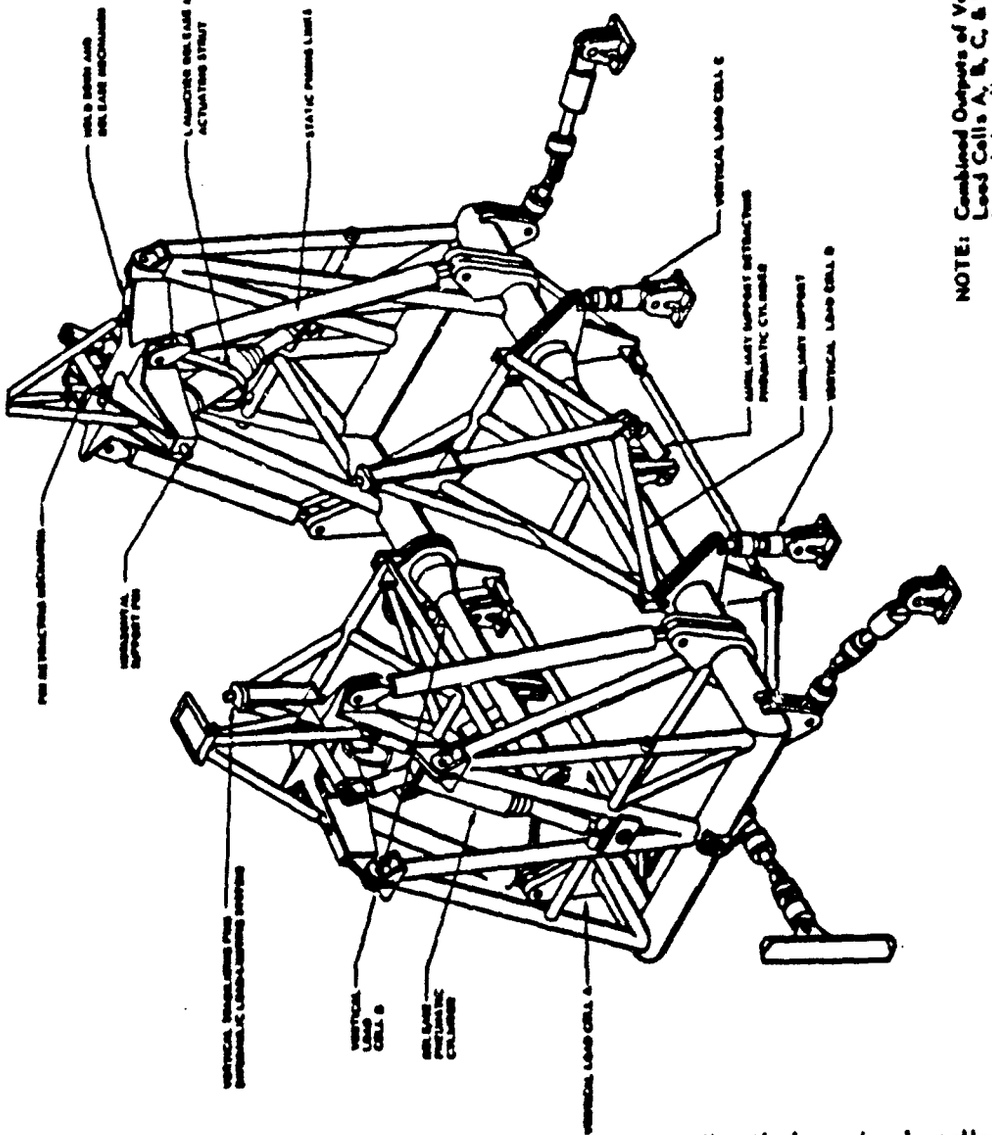
AIRBORNE PNEUMATICS SYSTEM





ELECTRICAL SYSTEM

CONVAIR ASTRONAUTICS



Missile Launcher Installation

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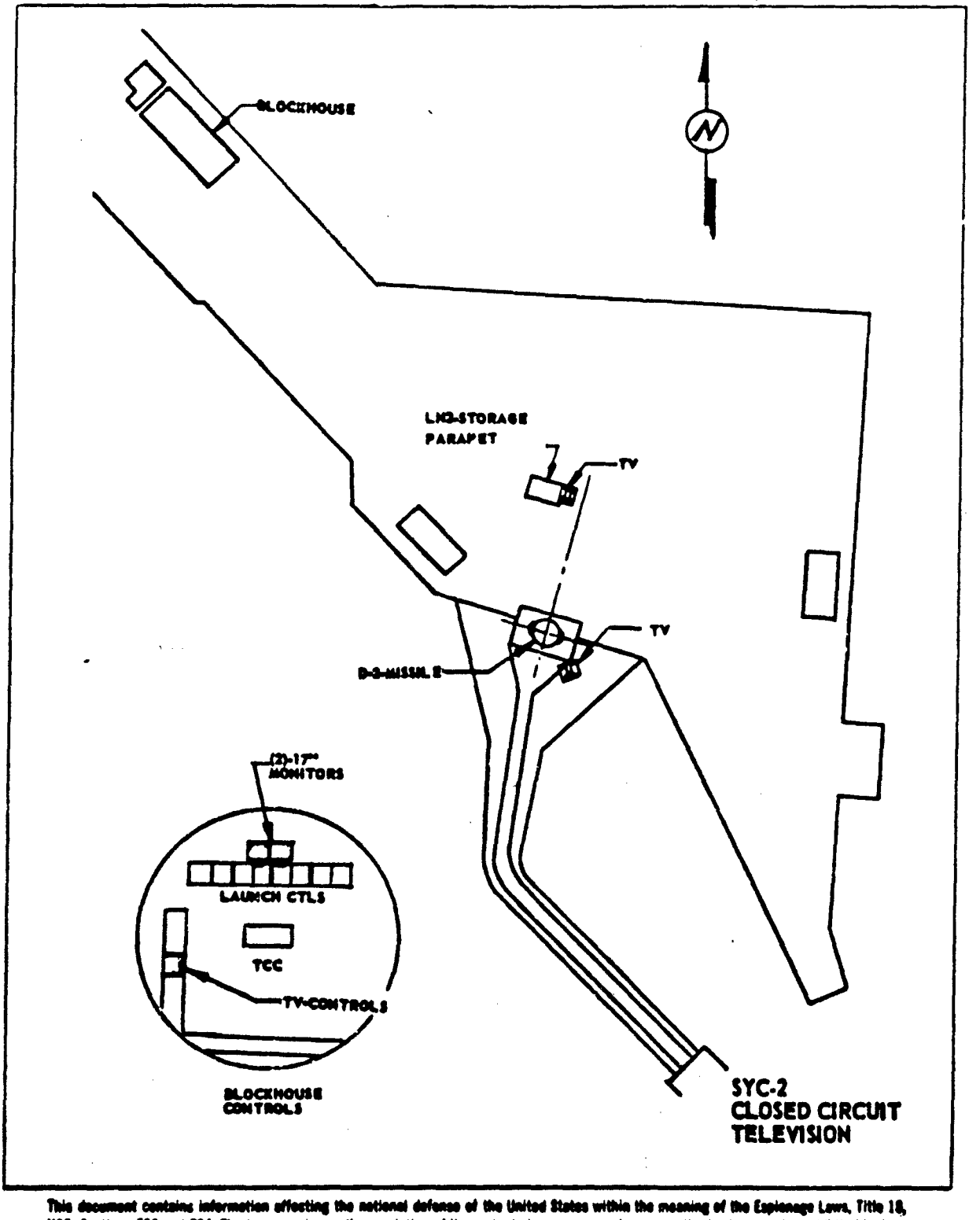

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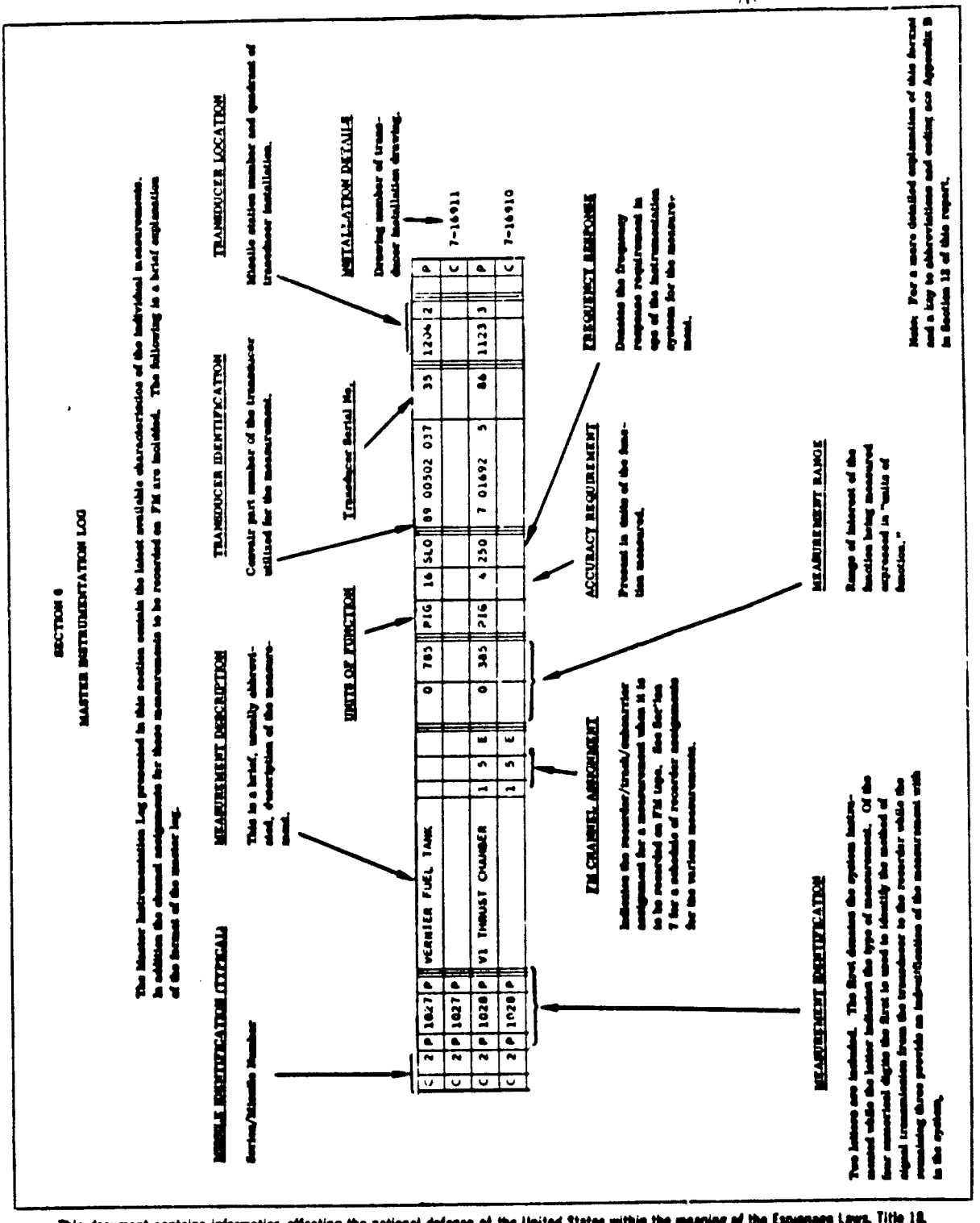
CONVAIR ASTRONAUTICS



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MISSILE INSTRUMENTATION LOG SHEET

REPORT NO. D24 FN CHAN DATE 11 SEP 59 PAGE 1

SECTION	1 MISSILE SERIES	2 MISSILE NO.	3 SYSTEM	4 MEASUREMENT NUMBER	5 TYPE MEASUREMENT	6 DESCRIPTION	7 TELEMETER NO.	8 SUB-CARRIER NO.	9 COMMUTATOR PIN NO.	10 MEASUREMENT RANGE LOW	MEASUREMENT RANGE HIGH	11 UNITS OF FUNCTION	12	13 RATE OF CHANGE OR FREQUENCY OF FUNCTION	14 TYPE OF TRANSDUCER	15 SERIAL NO.	16 STATION NO.	17 QUADRANT	18 TEST SEQUENCE	19 CARD CODE	REMARKS
	D	24	A			AIRFRAME															
	D	24	A	1489	Y	POD 1 SOUND PRESSURE				140	170	DB		2KC	7 01738 9		977	1		P	27 - 17557
	D	24	A	1493	Y	ENG COMP SOUND PRESS				140	170	DB		2KC	7 01738 9		1210	2		P	27 - 17556
	D	24	E			ELECTRICAL															
	D	24	E	1085	Q	INVERTER FREQUENCY	1	4	C	350	450	CPS		SLO						P	
	D	24	E	1029	Q	EXTERNAL AC FREQ	2	5	C	350	450	CPS		SLO						P	
	D	24	E	1083	V	BATTERY OUTPUT	1	4	11	15	35	VDC		SLO						P	
	D	24	E	1086	V	INVERTER PHASE A	1	4	C	90	140	VAC		SLO						P	
	D	24	E	1069	V	NSL EXTERNAL DC	2	5	5	0	40	VDC								P	
	D	24	F			PNEUMATICS															
	D	24	F	1994	C	DC TO BO VLV MOTOR				0	19	AMP		SLO						P	
	D	24	F	1001	P	LO2 TANK HELIUM	1	2	8	0	45	PIS		SLO	7 01723 11	2366	480	2		P	27 - 11608
	D	24	F	1003	P	FUEL TANK HELIUM	1	2	12	0	85	PIS		SLO	7 01723 13	2758	925	Y		P	27 - 11609
	D	24	F	1009	P	FUEL PRESS REG DISCH	1	4	8	10	75	PIA		SLO	89 00502 035	32	1269	2		P	27 - 17554
	D	24	F	1011	P	LO2 PRESS REG DISCH	1	11	8	0	40	PIA		SLO	89 00502 032		1171	4		P	27 - 17555
	D	24	F	1114	P	LO2 PRESS REG INLET	1	8	13	90	3000	PIA		200	7 01725 803		1187	4		P	27 - 17553
	D	24	F	1125	P	B CTL PNEU REG OUT	1	2	11	200	800	PIG		SLO	7 01731 5	3650	1243	4		P	27 - 10500

MISSILE INSTRUMENTATION LOG SHEET

REPORT NO. B24 PM CHAN DATE 11 SEP 59 PAGE 2

D	24	F	1246	P	S TK HC STL HI	1	11	11		0	3250	P16		SLO	7 01728	5		1238	1		P	27 - 16003
D	24	F	1288	P	ST PNEU REG OUT	1	2	7		0	600	P16		SLO	7 01720	1	1903	1223	2		P	27 - 16505
D	24	F	1291	P	S CTL HE STL	1	2	>		0	3500	P16		SLO	7 01720	5	2503	1223	2		P	27 - 16505
D	24	F	1113	T	LO2 PRESS REG INLET	1	4	7		M200	700	DSF		SLO	7 01684	3		1187	4		P	27 - 17593
D	24	F	1318	T	ST PNEU REG IN					M250	100	DSF			7 01684	7		1215	2		P	27 - 11600
D	24	M			HYDRAULICS																			
D	24	M	1093	P	B1 HYD ACCUMULATOR	2	12	12		0	5000	P16		50	7 01725	803	1024	1226	1		P	27 - 11600
D	24	M	1140	P	S/VERN HYD PRESS	2	12	11		0	3500	P16		SLO	7 01725	802	161	1191	1		P	27 - 11601
D	24	M	1206	P	B1 PCH ACTR EXTEND	2	6	9		0	3500	P1A		SLO	7 01720	5					P	
D	24	M	1207	P	B1 PCH ACTR RETRACT	2	9	9		0	3500	P1A		SLO	7 01720	5					P	
D	24	M	1208	P	B1 YAW ACTR EXTEND	2	11	9		0	3500	P1A		SLO	7 01720	5					P	
D	24	M	1209	P	B1 YAW ACTR RETRACT	2	13	9		0	3500	P1A		SLO	7 01720	5					P	
D	24	M	1197	X	GND HYD LO PRESS B					OFF	ON										P	
D	24	M	1198	X	GND HYD HI PRESS B					OFF	ON										P	
D	24	M	1199	X	GND HYD HI PRESS S&V					OFF	ON										P	
D	24	M	1200	X	GND HYD LO PRESS S&V					OFF	ON										P	
D	24	M			FACILITY																			
D	24	M	1011	F	MT & THST SYS-THRUST	1	6	11		M260	400	KPS		10							P	

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MISSILE INSTRUMENTATION LOG SHEET

REPORT NO. D24 FN CHAN DATE 11 SEP 59 PAGE 3

Missile Series	Missile No.	Phase	Measurement Number	Type Measurement	Description	Telemeter No.	Subcarrier No.	Commutator Pin No.	Measurement Range Low	Measurement Range High	Units of Function		Rate of Change or Frequency of Function	Type of Transducer	Serial No.	Station No.	Quadrant	Sequential	Card Code	Remarks
D	24	N	1969	X	AA 90% FUEL PROBE				OFF	ON	VDC		STP						C	
D	24	N	1970	X	AA 95% FUEL PROBE				OFF	ON	VDC		STP						P	
D	24	N	1971	X	AA 99.8% FUEL PROBE				OFF	ON	VDC		STP						P	
D	24	N	1972	X	AA 100.2% FUEL PROBE				OFF	ON	VDC		STP						P	
D	24	N	1973	X	AA LO2 RAPID SIG				OFF	ON	VDC		STP						P	
D	24	N	1974	X	AA LO2 BU RAPID SIG				OFF	ON	VDC		STP						P	
D	24	N	1975	X	AA LO2 FINE SIG				OFF	ON	VDC		STP						P	
D	24	N	1976	X	AA LO2 BU FINE SIG				OFF	ON	VDC		STP						P	
D	24	N	1977	X	AA LO2 TOPG COF SIG				OFF	ON	VDC		STP						P	
D	24	N	1978	X	AA LO2 ENG SIG				OFF	ON	VDC		STP						P	
D	24	P			PROPULSION															
D	24	P	1003	B	B2 PUMP SPEED	1	12	6	0	6790	RPM		SLO	7 01237 3		1228	4		P	27 - 17522
D	24	P	1004	B	B1 PUMP SPEED	1	11	5	0	6790	RPM		SLO	7 01237 3		1196	4		P	27 - 17522
D	24	P	1349	B	S PUMP SPEED	1	9	5	0	12.0	RPM		SLO	7 01437 13	C0107	1234	3		P	27 - 11611
D	24	P	1287	D	ACOUSTC FUL VLV XDCR	1	6	5	0	87.5	DEG		SLO						P	
D	24	P	1528	D	S MAIN FUEL VALVE	1	9	11	0	87.5	DEG		SLO	NAA					P	
D	24	P	1529	D	S MAIN LO2 VALVE	1	9	8	0	90	DEG		SLO	NAA					P	
D	24	P	1439	O	S NAA RCC ACCEL	2	10	C	0	2K	CPS		2K						P	
D	24	P	1439	O	S NAA RCC ACCEL	1	5	E	0	200	G		2K	NAA					P	

MISSILE INSTRUMENTATION LOG SHEET

REPORT NO. 824 FM CHAN DATE 11 SEP 59 PAGE 4

D	24	P	1452	O	B1 NAA RCC ACCEL	2	14	C	0	2K	CPS		2K								P			
D	24	P	1452	O	B1 NAA RCC ACCEL	1	3	E	0	200	G		2K	NAA							P			
D	24	P	1453	O	B2 NAA RCC ACCEL	2	2	E	0	200	G		2K	NAA							P			
D	24	P	1003	P	B2 LO2 PUMP INLET	1	12	A	0	120	PIG		250	7 01728 807		1222	4		P	27 - 17508				
D	24	P	1004	P	B2 FUEL PUMP INLET	1	12	13	0	100	PIG		250	7 01725 1	1044	1222	3		P	27 - 17500				
D	24	P	1006	P	S THRUST CHAMBER	1	8	E	0	1000	PIG		SLO	7 01687 7	4022	1240	2		P	27 - 16504				
D	24	P	1010	P	B1 LUB OIL INJ MAN	1	3	9	0	1500	PIG		SLO	7 01731 5	3670	1243	4		P	27 - 16505				
D	24	P	1026	P	B LO2 REG REFERENCE	1	3	6	0	600	PIG		SLO	7 01732 3	4318	1243	4		P	27 - 16500				
D	24	P	1027	P	VERNIER FUEL TANK	1	10	9	0	800	PIG		SLO	7 01731 3	3347	1223	2		P	27 - 16509				
D	24	P	1028	P	V1 THRUST CHAMBER	1	2	C	0	400	PIG		250	7 01725 5	880	1125	3		P	27 - 11414				
D	24	P	1029	P	V2 THRUST CHAMBER	1	10	E	0	400	PIG		250	7 01725 5	886	1125	1		P	27 - 17503				
D	24	P	1030	P	VERNIER LO2 TANK	1	5	9	0	800	PIG		SLO	7 01731 3	3877	1223	2		P	27 - 16505				
D	24	P	1047	P	V1 LO2 INLET	1	5	A	0	800	PIG		250	7 01720 1	1885	1125	4		P	27 - 16503				
D	24	P	1048	P	V2 LO2 INLET	1	10	A	0	800	PIG		250	7 01720 1	1894	1125	2		P	27 - 16503				
D	24	P	1049	P	V1 FUEL INLET	1	5	13	0	800	PIG		250	7 01720 1	1897	1125	2		P	27 - 16503				
D	24	P	1050	P	V2 FUEL INLET	1	10	13	0	800	PIG		250	7 01720 1	1878	1125	1		P	27 - 16503				
D	24	P	1055	P	S FUEL PUMP INLET	1	8	A	0	120	PIG		250	7 01725 807		1223	3		P	27 - 17502				
D	24	P	1056	P	S LO2 PUMP INLET	1	9	C	0	150	PIG		250	7 01728 807		1208	3		P	27 - 17502				
D	24	P	1059	P	B2 THRUST CHAMBER	1	12	E	0	400	PIG		250	7 01731 1	3874	1220	3		P	27 - 16501				
D	24	P	1060	P	B1 THRUST CHAMBER	1	11	C	0	400	PIG		250	7 01731 1	3604	1220	4		P	27 - 16501				
D	24	P	1091	P	B1 LO2 INJ MANIFOLD				0	1500	PIA		12C	27 01309 1		1212	4		P	27 - 11001				
D	24	P	1092	P	B2 LO2 INJ MANIFOLD				0	1500	PIA		12C	27 01309 1		1212	2		P	27 - 11001				
D	24	P	1093	P	B1 FUEL INJ MANIFOLD				0	1500	PIG		12C	7 01687 17		1212	1		P	27 - 11001				

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REPORT NO. B24 FN CHAN   DATE 11 SEP 59   PAGE 9

Missile Series	Missile No.	System	Measurement Number	Type Measurement	DESCRIPTION	Telemeter No.	Subchannel No.	Commutator Pin No.	Measurement Range Low	Measurement Range High	Units of Function		Rate of Change or Frequency of Function	Type of Transducer	Serial No.	Station No.	Quadrant	Peripheral	Card Code	Drawing Number
D	24	P	1094	P	B2 FUEL INJ MANIFOLD				0	1500	P16		12C	7 01687 17		1212	3		P	27 - 11001
D	24	P	1180	P	BBG COMBUSTION CHM	1	11	12	0	700	P16		250	7 01731 3	4294	1243	4		P	27 - 16500
D	24	P	1330	P	S FUEL PUMP DISCH	1	13	C	0	1500	P16		SLO	7 01731 7	4288	1233	2		P	27 - 16504
D	24	P	1332	P	S LO2 PUMP DISCH	1	8	9	0	1500	P16		SLO	7 01731 7	4294	1242	1		P	27 - 16504
D	24	P	1339	P	S GAS GEN DISCH	1	8	10	0	1000	P16		SLO	7 01731 9	4229	1228	2		P	27 - 16504
D	24	P	1341	P	S LUBE OIL MANIFOLD	1	3	13	0	1200	P16		SLO	7 01731 9	3731	1248	1		P	27 - 16504
D	24	P	1344	P	S LO2 REG REFERENCE	1	3	10	0	1000	P10		SLO	7 01732 9	4243	1240	1		P	27 - 16504
D	24	P	1350	P	S FUEL INJ MANIFOLD				13	1000	P16		12C	27 01309 1		1210	3		P	27 - 11002
D	24	P	1351	P	S LO2 INJ MANIFOLD	1	6	C	0	1500	P16		12C	7 01731 9	3672	1233	1		P	27 - 16504
D	24	P	1465	P	S LO PR LUBE OIL MAN	1	3	A	0	150	P16		SLO	7 01730 1	247	1248	2		P	27 - 16504
D	24	P	1682	P	PRESS DIFF ON LO2 TK	2	10	5	0	2	PID		SLO	7 43031 1		498	1		P	27 - 17541
D	24	P	1683	P	PRESS DIFF FUEL TK	2	10	7	0	2	PID		SLO	87 93900 017		980	2		P	27 - 17542
D	24	P	1017	T	B2 TURBINE INLET	1	11	7	0	1500	DGF		SLO	7 01265 801	11	1202	3		P	27 - 17501
D	24	P	1021	T	LO2 AT BREAKAWAY VLV	1	9	7	M300	M270	DGF		SLO	7 01649 7	116	1170	4		P	27 - 16501
D	24	P	1326	T	S TURBINE INLET	1	8	6	0	1500	DGF		SLO	7 01265 801		1255	3		P	27 - 17525
D	24	P	1673	T	B1 FUEL IGN VLV AMB				40	180	DGF		SLO	T/ C WIR E		1220	1		P	27 - 16512
D	24	P	1674	T	B2 FUEL IGN VLV AMB				40	180	DGF		SLO	T/ C WIR E		1220	2		P	27 - 16512
D	24	P	1675	T	ENG CTL PNEU MAN AMB				40	180	DGF		SLO	T/ C WIR E		1207	3		P	27 - 16812
D	24	P	1677	T	FIRE DETECTOR-EDISON				0	600	DGF		SLO	ED 1530 WIR E		1200			P	27 - 17528
D	24	P	1754	T	B1 PRG LN NEAR BLKHD				20	70	DGF		SLO	T/ C		1206	4		P	27 - 11001
D	24	P	1767	T	B1 CHAMBER SK T				20	90	DGF		SLO	T/ C		1236	1		P	27 - 11001
D	24	P	1768	T	B1 PRG LN @ ENG MAN				20	90	DGF		SLO	T/ C		1380	1		P	27 - 11001
D	24	P	1077	E	VERNIER CUTOFF RELAY	1	4	5	OFF	ON	VDC		STP						P	

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SERIAL NUMBER	SERIAL NO.	PHASE	TRANSDUCER NUMBER	TYPE TRANSDUCER	DESCRIPTION	TRANSDUCER NO.	TRANSDUCER NO.	CONDITIONER PWR NO.	MEASUREMENT RANGE LOW	MEASUREMENT RANGE HIGH	UNITS OF FUNCTION		RATE OF CHANGE OR FREQUENCY OF FUNCTION	TYPE OF TRANSMISSION	SERIAL NO.	SEARCH NO.	BROADBAND	NEED-LINE-TRACE	CARD CODE	REMARKS
D	24	P	1077	X	VERNIER CUTOFF RELAY	2	8	5	OFF	ON	VDC		STP						P	
D	24	P	1311	X	90% FUEL LVL IND				OFF	ON									P	
D	24	P	1592	X	BOOSTER ENG CUTOFF	1	4	5	OFF	ON	VDC		STP						P	
D	24	P	1592	X	BOOSTER ENG CUTOFF	2	8	5	OFF	ON	VDC		STP						P	
D	24	P	1593	X	SUSTAINER ENG CUTOFF	1	4	5	OFF	ON	VDC		STP						P	
D	24	P	1593	X	SUSTAINER ENG CUTOFF	2	8	5	OFF	ON	VDC		STP						P	
D	24	P	1622	X	S FLIGHT LOCKIN	1	4	5	OFF	ON	VDC		STP						P	
D	24	P	1622	X	S FLIGHT LOCKIN	2	8	5	OFF	ON	VDC		STP						P	
D	24	P	1626	X	PROP DEPL COF ARMING				OFF	ON	VDC		STP						P	
D	24	P	1629	X	PROP DEPLETION COF				OFF	ON	VDC		STP						P	
D	24	P	1631	X	LO2 F&D VLV AIRB OPN				OFF	ON	VDC		STP						P	
D	24	P	1632	X	LO2 F&D VLV AIRB CLS				OFF	ON	VDC		STP						P	
D	24	P	1633	X	LO2 F&D VLV GND OPN				OFF	ON	VDC		STP						P	
D	24	P	1634	X	LO2 F&D VLV GND CLS				OFF	ON	VDC		STP						P	
D	24	P	1635	X	FUL F&D VLV AIRB OPN				OFF	ON	VDC		STP						P	
D	24	P	1636	X	FUL F&D VLV AIRB CLS				OFF	ON	VDC		STP						P	
D	24	P	1637	X	FUL F&D VLV GND OPN				OFF	ON	VDC		STP						P	
D	24	P	1638	X	FUL F&D VLV GND CLS				OFF	ON	VDC		STP						P	
D	24	P	1987	X	FUEL OVERFILL PROBE				OFF	ON	VDC		STP						P	
D	24	P	1988	X	LO2 95% LVL EMER COF				OFF	ON	VDC		STP						P	
D	24	P	1997	X	MSL FUELED 95%				OFF	ON	VDC		STP						P	
D	24	P	1998	X	LO2 O/FILL EMER COF				OFF	ON	VDC		STP						P	
D	24	P	1999	X	MSL FUELED 100%				OFF	ON	VDC		STP						P	
D	24	S			AUTOPILOT															

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SECTION	1 SIGNAL SOURCE	2 SIGNAL NO.	3 SYSTEM	4 MEASUREMENT NUMBER	5 TYPE MEASUREMENT	6 DESCRIPTION	7 TELEMETER NO.	8 SUB-CARRIER NO.	9 COMMUTATOR PIN NO.	10 MEASUREMENT RANGE LOW	MEASUREMENT RANGE HIGH	11 UNITS OF FUNCTION	12 DATE OF CHANGE OR REQUEST OF FUNCTION	13 TYPE OF TRANSDUCER	14 SERIAL NO.	15 STATION NO.	16 GUARANTEE	17 TELEMETERED	18 CARD CODE	DRAWING NUMBER
	1	2 3 4	5 6	7	8	9	10 11	12 13	14 15	16 17 18 19	20 21 22 23	24 25 26	27 28 29	30 31 32 33 34 35 36 37 38 39	40 41	42 43	44 45	46	47	48
	D	24	S	1252	D	B1 YAW	2	12	7	0	20	CPS		SLO	7 01680 1					P	
	D	24	S	1253	D	B2 YAW	2	12	8	0	20	CPS		SLO	7 01 68 0	1	1212	Y		P	27 - 11612
	D	24	S	1254	D	B1 PITCH	2	5	8	0	20	CPS		SLO	7 01680 1		1212	4		P	27 - 11613
	D	24	S	1255	D	B2 PITCH	2	12	5	0	20	CPS		SLO	7 0168U 1		1212	3		P	27 - 11613
	D	24	S	1107	V	B1 PCH ACTR FEEDBAK	2	2	9	M12	12	VAC		30						P	
	D	24	S	1108	V	B2 PCH ACTR FEEDBAK	2	2	10	M12	12	VAC		30						P	
	D	24	S	1113	V	V1 YAW ACTR FEEDBACK	2	4	9	M5	7	VAC		30						P	
	D	24	S	1114	V	V2 YAW ACTR FEEDBACK	2	4	10	M5	7	VAC		30						P	
	D	24	S	1118	V	V2 PCH ACTR FEEDBAK	2	4	13	M11	11	VAC		30						P	
	D	24	S	1119	V	V1 PCH ACTR FEEDBAK	2	8	12	M11	11	VAC		30						P	
	D	24	S	1122	V	SERVO TEST SIG	2	8	11	M11	11	VAC		30						P	
	D	24	S	1128	V	B1 YAW ACTR FEEDBAK	2	2	13	M12	12	VAC		30						P	
	D	24	S	1129	V	B2 YAW ACTR FEEDBAK	2	2	A	M12	12	VAC		30						P	
	D	24	S	1147	V	PITCH GYRO AMP OUT	2	3	7	M10	10	VAC		30						P	
	D	24	S	1148	V	YAW GYRO AMP OUT	2	3	8	M10	10	VAC		30						P	
	D	24	S	1149	V	ROLL GYRO AMP OUT	2	3	11	M10	10	VAC		30						P	
	D	24	S	1216	V	S PCH ACTR FEEDBACK	2	8	7	M10	10	VAC		30						P	
	D	24	S	1217	V	S YAW ACTR FEEDBACK	2	8	8	M10	10	VAC		30						P	
	D	24	U			PROPELLANT UTILIZ															
	D	24	U	1080	P	LO2 TANK HEAD	2	10	8	0	5	PID		SLO	7 01225 3	212	1075	1		P	27 - 11002
	D	24	U	1081	P	FUEL TANK HEAD	2	10	11	0	5	PID		SLO	7 01225 3		1075	1		P	27 - 11002

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SERIAL RECORD	MODULE NO.	SYSTEM	MEASUREMENT NUMBER	TYPE MEASUREMENT	DESCRIPTION	TELEMETRY NO.	SUBCARRIER NO.	OSCILLATOR FM NO.	MEASUREMENT RANGE LOW	MEASUREMENT RANGE HIGH	UNITS OF FUNCTION		RATE OF CHANGE OR FREQUENCY OF FUNCTION	TYPE OF TRANSDUCER	SERIAL NO.	STATION NO.	SUBCARRIER	TELEMETRY	CABLE CODE	
D	24	U	1174	T	ACOUSTICA COMP TEMP				M100	150	DGF		SLO	I/C T/C		946	4		P	27 - 11002
D	24	U	1091	V	ERROR RATIO DEMOD OP	1	6	8	M20	20	VDC		20						P	
D	24	U	1113	V	ACOUSTICA VLV POS FB	1	6	12	0	22	VDC		4						P	
D	24	U	1134	X	AA TIME SHARD OSC OP	1	10	10	0	8.8	VDC		8						P	
D	24	U	1135	X	ACOUSTICA SNSRS SIG	1	13	12	0	8	VDC		8						P	
D	24	U	1148	X	LO2 2 SNSRS STA 547				OFF	ON	VDC		STP						P	
D	24	U	1149	X	LO2 2 SNSRS STA 666				OFF	ON	VDC		STP						P	
D	24	U	1150	X	LO2 2 SNSRS STA 758				OFF	ON	VDC		STP						P	
D	24	U	1151	X	LO2 2 SNSRS STA 836				OFF	ON	VDC		STP						P	
D	24	U	1152	X	LO2 2 SNSRS STA 888				OFF	ON	VDC		STP						P	
D	24	U	1153	X	LO2 2 SNSRS STA 910				OFF	ON	VDC		STP						P	
D	24	U	1160	X	FUEL 2 SNSRS STA 944				OFF	ON	VDC		STP						P	
D	24	U	1161	X	FUEL 2 SNSRS STA 102	4			OFF	ON	VDC		STP						P	
D	24	U	1162	X	FUEL 2 SNSRS STA 108	3			OFF	ON	VDC		STP						P	
D	24	U	1163	X	FUEL 2 SNSRS STA 112	6			OFF	ON	VDC		STP						P	
D	24	U	1164	X	FUEL 2 SNSRS STA 114	1			OFF	ON	VDC		STP						P	
D	24	U	1165	X	FUEL 2 SNSRS STA 119	6			OFF	ON	VDC		STP						P	

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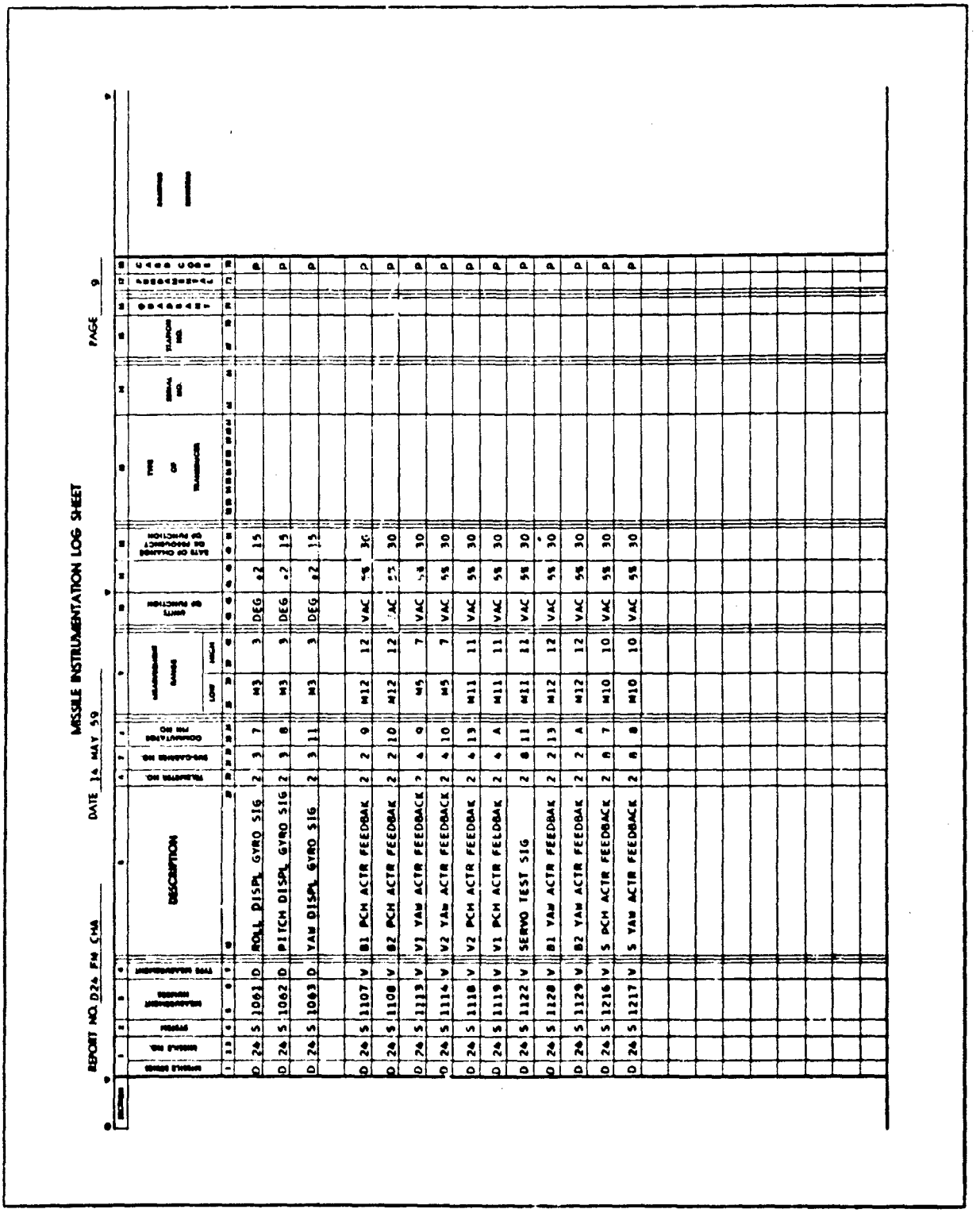

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MISSILE SERIES	MISSILE NO.	PROGRAM	MEASUREMENT NUMBER	TYPE MEASUREMENT	DESCRIPTION	TELEMETRY NO.	SYNCHRONIZER NO.	COMMUTATOR PAM NO.	MEASUREMENT RANGE LOW	MEASUREMENT RANGE HIGH	UNITS OF MEASUREMENT	DATA OF CHANGED OF FREQUENCY OF FUNCTION	TYPE OF TRANSMISSION	SERIAL NO.	STATION NO.
D	26	S	1001	D	ROLL DISPL GYRO SIG	2	3	7	M3	3	DEG	±2	15		
D	26	S	1002	D	PITCH DISPL GYRO SIG	2	3	8	M3	3	DEG	±2	15		
D	26	S	1003	D	YAW DISPL GYRO SIG	2	3	11	M3	3	DEG	±2	15		
D	26	S	1107	V	B1 PCH ACTR FEEDBAK	2	2	9	M12	12	VAC	5%	30		
D	26	S	1108	V	B2 PCH ACTR FEEDBAK	2	2	10	M12	12	VAC	5%	30		
D	26	S	1113	V	V1 YAW ACTR FEEDBACK	2	4	9	M5	7	VAC	5%	30		
D	26	S	1114	V	V2 YAW ACTR FEEDBACK	2	4	10	M5	7	VAC	5%	30		
D	26	S	1118	V	V2 PCH ACTR FEEDBAK	2	4	13	M11	11	VAC	5%	30		
D	26	S	1119	V	V1 PCH ACTR FEEDBAK	2	4	A	M11	11	VAC	5%	30		
D	26	S	1122	V	SERVO TEST SIG	2	8	11	M11	11	VAC	5%	30		
D	26	S	1128	V	B1 YAW ACTR FEEDBAK	2	2	13	M12	12	VAC	5%	30		
D	26	S	1129	V	B2 YAW ACTR FEEDBAK	2	2	A	M12	12	VAC	5%	30		
D	26	S	1216	V	S PCH ACTR FEEDBACK	2	8	7	M10	10	VAC	5%	30		
D	26	S	1217	V	S YAW ACTR FEEDBACK	2	8	8	M10	10	VAC	5%	30		

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[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	DESCRIPTION	[illegible]	[illegible]	[illegible]	Low	High	[illegible]	[illegible]	[illegible]	Type of Transducer	Serial No.	Station No.	Quadrant	Fundamental	Card Code	[illegible]
D	24	U	1091	V	ERROR RATIO DEMOD OP	1	6	8	M20	20	VDC	.5	20						P	
D	24	U	1112	V	ACOUS COUNTER OTP A	1	13	5	0	6	VDC	.04	8						P	
D	24	U	1112	V	ACOUS COUNTER OTP B	1	13	7	0	6	VDC	.04	8						P	
D	24	U	1112	V	ACOUS COUNTER OTP C	1	13	8	0	6	VDC	.04	8						P	
D	24	U	1112	V	ACOUS COUNTER OTP D	1	13	11	0	6	VDC	.04	8						P	
D	24	U	1113	V	ACOUSTICA VLV POS FB	1	13	E	0	22	VDC	.4	4						P	
D	24	U	1135	X	ACOUSTICA SNSRS SIG	1	13	12	0	.8	VDC	.04	8						P	

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FORM NO. A-703-2

CONVAIR ASTRONAUTICS

SECTION 7

TEST PLAN & RECORDER ASSIGNMENTS BY SYSTEM

This section indicates the recorder assignment of each measurement for each block in which the measurement is required. In addition the code of the test objectives supported by each measurement and the measurement priority in regard to each of those objectives are listed after each measurement. The following is a brief explanation of the format used in this section.

MEASUREMENT IDENTIFICATION

Two letters are included; the first denotes the system instrumented while the latter indicates the type of measurement.
The first numerical digit denotes the method of data transmission from the transducer to the recorder; i. e., direct wire. The other three digits denote the measurement number within the system indicated by the first letter.

OBJECTIVE CODE

Test objectives supported by a measurement are indicated by listing the code of those objectives beneath the measurement. Table I may be used to correlate this code with the actual test objectives.

BLOCK I RECORDER ASSIGNMENT

This code defines the method to be utilized to record the measurement when it is required during Block I testing. The double letter here indicates that this measurement will be recorded on both a strip chart and on an FM tape.

BLOCK II RECORDER ASSIGNMENT

MEASUREMENT DESCRIPTION

C 2 H 1033 P	B1 HYD ACCUMULATOR			F	
C 2 H 1033 P		BK22		2	42010
C 2 H 1140 P	S/VERN HYD PRESS		BF	F	
C 2 H 1140 P		BH50		1	42220
C 2 H 1140 P		PB22	2	2	42220

MISSILE IDENTIFICATION (TYPICAL)

Series/Missile Number

BLOCK I PRIORITY

This number defines the priority of this measurement during Block I testing in regard to the test objective represented by the objective code. A priority is assigned only where the objective is scheduled.

BLOCK II PRIORITY

PROBLEM AREA CODE

This code, although not utilized in this section, provides a means of grouping related measurements for instrumentation planning. (IBM sorting)

Note: For a more detailed explanation of this format and a key to the abbreviations and coding see Appendix B in Section 12 of this report.

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D24 OBJ TEST PLAN

OBJ. CODE	DESCRIPTION	1	2
	A 1489 Y POD 1 SOUND PRESS	F	F
AD17	A 1489 Y	1	1
	A 1493 Y ENG COMP SOUND PRESS	F	F
AD17	A 1493 Y	1	1
	E 1005 Q INVERTER FREQUENCY	F	F
ED15	E 1005 Q		1
SD14	E 1005 Q	2	2
SD15	E 1005 Q	2	2
	E 1029 Q INVERTER FREQUENCY	F	F
SD14	E 1029 Q	2	2
SD15	E 1029 Q	2	2
	E 1003 V BATTERY OUTPUT		F
ED15	E 1003 V		1
	E 1006 V INVERTER PHASE A	F	F
ED15	E 1006 V		1
SD14	E 1006 V	2	2
SD15	E 1006 V	2	2
	E 1065 V MSL EXTERNAL DC	F	F
FD33	F 1994 C DC TO BO VLV MOTOR	2	2
	F 1001 P LO2 TANK HELIUM	SF	SF
FD33	F 1001 P	1	1
FD37	F 1001 P	1	1

D24 OBJ TEST PLAN

WD02	F 1001 P	2	2
WD02	F 1001 P	2	2
WD05	F 1001 P		2
	F 1003 P FUEL TANK HELIUM	SF	SF
FD33	F 1003 P	1	1
FD37	F 1003 P	1	1
WD02	F 1003 P	2	2
01	F 1003 P	1A	1A
	F 1009 P FUEL REG DISCH	F	F
FD33	F 1009 P	2	2
FD37	F 1009 P	1	1
	F 1011 P LO2 PRESS REG DISCH	F	F
FD33	F 1011 P	2	2
FD37	F 1011 P	1	1
	F 1114 P LO2 PRESS REG INLET	F	F
FD33	F 1114 P	2	2
FD37	F 1114 P	2	2
	F 1125 P B CTL PNEU REG OUT	SF	SF
FD33	F 1125 P	2	2
01	F 1125 P	1A	1A
	F 1246 P B TANK HE BOTTLES HI	SF	SF
FD33	F 1246 P	2	2
FD37	F 1246 P	2	2
01	F 1246 P	1A	1A
	F 1288 P ST PNEU REG OUT	SF	SF
FD33	F 1288 P	2	2
01	F 1288 P	1A	1A
	F 1291 P S CTL HE BTL	FS	FS

D24 OBJ TEST PLAN

FD33	F 1291 P	2	2
01	F 1291 P	1A	1A
	F 1115 T LO2 PRESS REG INLET	F	F
FD33	F 1115 T	2	2
FD37	F 1115 T	2	2
	F 1318 T ST PNEU REG IN	S	S
FD33	F 1318 T	2	2
	H 1033 P B1 HYD ACCUMULATOR	FS	FS
HD22	H 1033 P	1	1
HD26	H 1033 P	1	1
SD14	H 1033 P	2	2
	H 1140 P SUS/VERN HYD PRESS	FS	FS
HD23	H 1140 P	1	1
HD26	H 1140 P	1	1
HD33	H 1140 P	1	1
SD15	H 1140 P	2	2
	H 1206 P B1 PCH ACTR EXTEND		FS
SD30	H 1206 P		1
	H 1207 P B1 PCH ACTR RETRACT		FS
SD30	H 1207 P		1
	H 1208 P B1 YAW ACTR EXTEND		FS
SD30	H 1208 P		1
	H 1209 P B1 YAW ACTR RETRACT		FS
SD30	H 1209 P		1
	H 1197 X GND HYD LO PRESS	R	R
HD46	H 1197 X	1	1

D24 OBJ TEST PLAN

	H 1198 X GND HYD HI PRESS	R	R
HD46	H 1198 X	1	1
	H 1199 X GND HYD HI PRESS S&V	R	R
HD46	H 1199 X	1	1
	H 1200 X GND HYD LO PRESS S&V	R	R
HD46	H 1200 X	1	1
	N 1011 F WT & THST SYS THRUST	SF	SF
LD13	N 1011 F	1	1
LD15	N 1011 F	2	
PD29	N 1011 F	1	1
UD20	N 1011 F	1	1
UD24	N 1011 F	2	2
WD01	N 1011 F	1	1
WD02	N 1011 F	1	1
WD05	N 1011 F		1
	N 1969 X AA 90% FUEL PROBE	R	R
	N 1970 X AA 95% FUEL PROBE	R	R
	N 1971 X AA 99.8% FUEL PROBE	R	R
UD24	N 1971 X	2	2
WD05	N 1971 X		1
	N 1972 X AA 100.2% FUEL PROBE	R	R
UD24	N 1972 X	2	2
WD05	N 1972 X		1
	N 1973 X AA LO2 RAPID SIG	R	R
	N 1974 X AA LO2 BU RAPID SIG	R	R

D24 OBJ TEST PLAN

	N 1975 X AA LO2 FINE SIG	R	R
	N 1976 X AA LO2 BU FINE SIG	R	R
		2	2
UD24	N 1976 X		1
WD05	N 1976 X		
	N 1977 X AA LO2 TOPG COF SIG	R	R
		2	2
UD24	N 1977 X		1
WD05	N 1977 X		
	N 1978 X AA LO2 EMG SIG	R	R
		2	2
UD24	N 1978 X		1
WD05	N 1978 X		
	P 1083 B B2 PUMP SPEED	FS	FS
		1	1
PD14	P 1083 B	1	1
PD15	P 1083 B	1	
PD28	P 1083 B	2	2
PD29	P 1083 B	1B	1B
02	P 1083 B		
	P 1084 B B1 PUMP SPEED	FS	FS
		1	1
PD14	P 1084 B	1	1
PD15	P 1084 B	1	
PD28	P 1084 B	2	2
PD29	P 1084 B	1B	1B
02	P 1084 B		
	P 1349 B S PUMP SPEED	FS	FS
		1	1
PD14	P 1349 B	1	1
PD19	P 1349 B	1	1
PD23	P 1349 B	1	
PD28	P 1349 B	2	2
PD29	P 1349 B	1	1
PD37	P 1349 B	1B	1B
02	P 1349 B		
	P 1287 D ACOUSTIC FUL VLV XDR	SF	SF

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D24 OBJ TEST PLAN

UD15	P 1287 D		1
UD24	P 1287 D	2	2
	P 1528 D S MAIN FUEL VALVE	SF	SF
		2	2
MD23	P 1528 D	1	
PD28	P 1528 D	1	1
PD37	P 1528 D	1	1
UD20	P 1528 D	1A	1A
01	P 1528 D		
	P 1529 D S MAIN LO2 VALVE	SF	SF
		2	2
MD23	P 1529 D	1	
PD28	P 1529 D	2	2
PD37	P 1529 D		2
UD15	P 1529 D	2	2
UD20	P 1529 D		
	P 1439 O S NAA RCC ACCEL	FO	FO
PD29	P 1439 O	2	2
	P 1452 O B1 NAA RCC ACCEL	F	F
PD29	P 1452 O	2	2
	P 1453 O B2 NAA RCC ACCEL	F	F
PD29	P 1453 O	2	2
	P 1003 P B2 LO2 PUMP INLET	F	F
PD18	P 1003 P	2	2
	P 1004 P B2 FUEL PUMP INLET	F	F
PD18	P 1004 P	2	2
	P 1006 P S THRUST CHAMBER	F	F
PD14	P 1006 P	1	1
PD28	P 1006 P	1	
PD29	P 1006 P	1	1

D24 OBJ TEST PLAN

		1 1
PD37	P 1006 P	1B 1B
02	P 1006 P	
	P 1010 P B1 LUBE OIL INJ MAN	SF SF
		1A 1A
01	P 1010 P	
	P 1026 P B LO2 REG REFERENCE	SF SF
		2 2
PD14	P 1026 P	2 2
PD15	P 1026 P	1
PD28	P 1026 P	1A 1A
01	P 1026 P	
	P 1027 P VERNIER FUEL TANK	F F
		1 1
PD14	P 1027 P	1 1
PD19	P 1027 P	1 1
PD23	P 1027 P	1
PD28	P 1027 P	
	P 1028 P V1 THRUST CHAMBER	F F
		1 1
PD14	P 1028 P	1 1
PD19	P 1028 P	2 2
PD23	P 1028 P	1
PD28	P 1028 P	1 1
PD29	P 1028 P	1B 1B
02	P 1028 P	
	P 1029 P V2 THRUST CHAMBER	F F
		1 1
PD14	P 1029 P	1 1
PD19	P 1029 P	2 2
PD23	P 1029 P	1
PD28	P 1029 P	1 1
PD29	P 1029 P	1B 1B
02	P 1029 P	
	P 1030 P VERNIER LO2 TANK	F F
		1 1
PD14	P 1030 P	1 1
PD19	P 1030 P	1 1
PD23	P 1030 P	

D24 OBJ TEST PLAN

PD28	P 1030 P	1	
PD29	P 1030 P	1	1
	P 1047 P V1 LO2 INLET	F	F
PD14	P 1047 P	2	2
PD19	P 1047 P	1	1
PD23	P 1047 P	1	1
PD28	P 1047 P	1	
	P 1048 P V2 LO2 INLET	F	F
PD14	P 1048 P	2	2
PD19	P 1048 P	1	1
PD23	P 1048 P	1	1
PD28	P 1048 P	1	
	P 1049 P V1 FUEL INLET	F	F
PD14	P 1049 P	2	2
PD19	P 1049 P	1	1
PD23	P 1049 P	1	1
PD28	P 1049 P	1	
	P 1050 P V2 FUEL INLET	F	F
PD14	P 1050 P	2	2
PD19	P 1050 P	1	1
PD23	P 1050 P	1	1
PD28	P 1050 P	1	
	P 1055 P S FUEL PUMP INLET	F	F
PD29	P 1055 P	2	2
PD37	P 1055 P	2	2
	P 1056 P S LO2 PUMP INLET	F	F
PD37	P 1056 P	2	2
02	P 1056 P	18	18
	P 1059 P B2 THRUST CHAMBER	F	F
PD14	P 1059 P	1	1

D24 OBJ TEST PLAN

PD15	P 1059 P	1	1
PD28	P 1059 P	1	
PD29	P 1059 P	1	1
02	P 1059 P	18	18
	P 1060 P B1 THRUST CHAMBER	F	F
PD14	P 1060 P	1	1
PD15	P 1060 P	1	1
PD28	P 1060 P	1	
PD29	P 1060 P	1	1
02	P 1060 P	18	18
	P 1091 P B1 LO2 INJ MANIFOLD	0	0
02	P 1091 P	18	18
	P 1092 P B2 LO2 INJ MANIFOLD	0	0
02	P 1092 P	18	18
	P 1093 P B1 FUEL INJ MANIFOLD	0	0
02	P 1093 P	18	18
	P 1094 P B2 FUEL INJ MANIFOLD	0	0
02	P 1094 P	18	18
	P 1100 P B GG COMBUSTION CHM	F	F
PD14	P 1100 P	2	2
PD15	P 1100 P	2	2
PD28	P 1100 P	1	
PD29	P 1100 P	2	2
	P 1330 P S FUEL PUMP DISCH	F	F
PD14	P 1330 P	1	1
PD19	P 1330 P	1	1
PD23	P 1330 P	2	2
PD28	P 1330 P	1	
PD37	P 1330 P	2	2
02	P 1330 P	18	18

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D24 OBJ TEST PLAN

	P 1332 P S LO2 PUMP DISCH	F	F
		1	1
PD14	P 1332 P	1	1
PD19	P 1332 P	2	2
PD23	P 1332 P	1	
PD28	P 1332 P	2	2
PD37	P 1332 P		
	P 1339 P S GAS GEN DISCH	F	F
		2	2
PD14	P 1339 P	1	
PD28	P 1339 P	2	2
PD29	P 1339 P	2	2
PD37	P 1339 P		
	P 1341 P S LUBE OIL MANIFOLD	SF	SF
		1A	1A
01	P 1341 P		
	P 1344 P S LO2 REG REFERENCE	SF	SF
		2	2
PD14	P 1344 P	1	
PD28	P 1344 P	1A	1A
01	P 1344 P		
	P 1350 P S FUEL INJ MANIFOLD	0	0
		1B	1B
02	P 1350 P		
	P 1351 P S LO2 INJ MANIFOLD	0	0
		2	2
PD14	P 1351 P	2	2
PD23	P 1351 P	2	2
PD37	P 1351 P	1B	1B
02	P 1351 P		
	P 1465 P S LO PR LUB OIL MAN	SF	SF
		1A	1A
01	P 1465 P		
	P 1682 P PRESS DIFF ON LO2 TK	FS	FS
			2
UD15	P 1682 P	2	2
UD24	P 1682 P	1	1
WD01	P 1682 P		

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D24 OBJ TEST PLAN

		1 1
WD02	P 1682 P	2
WD05	P 1682 P	
	P 1683 P PRESS DIFF ON FUL TK	FS FS
		2
UD15	P 1683 P	2 2
UD24	P 1683 P	2 2
WD01	P 1683 P	1 1
WD02	P 1683 P	2
WD05	P 1683 P	
	P 1017 T B2 TURBINE INLET	SF SF
		2 2
PD14	P 1017 T	2 2
PD15	P 1017 T	1
PD28	P 1017 T	1A 1A
01	P 1017 T	
	P 1021 T LO2 AT BRKAWAY VLV	SF SF
		2 2
PD14	P 1021 T	1 1
PD29	P 1021 T	2 2
WD01	P 1021 T	
	P 1326 T S TURBINE INLET	SF SF
		2 2
PD14	P 1326 T	1
PD28	P 1326 T	1A 1A
01	P 1326 T	
	P 1673 T B1 FUEL IGN VLV AMB	S S
01	P 1673 T	1A 1A
	P 1674 T B2 FUEL IGN VLV AMB	S S
01	P 1674 T	1A 1A
	P 1675 T ENG CTL PNEU MAN	S S
01	P 1675 T	1A 1A
	P 1677 T FIRE DETECTOR EDISON	S S

D24 OBJ TEST PLAN

01	P 1677 T	1A	1A
	P 1764 T B1 PRG LN NEAR BLKHD	S	S
PD65	P 1764 T	1	
	P 1767 T B1 CHAMBER SK T	S	S
PD15	P 1767 T	2	2
	P 1768 T B1 PURG LN @ ENG MAN	S	S
PD65	P 1768 T	1	
	P 1311 X 90% FUEL LVL IND	R	R
	P 1626 X PROP DEFL COF ARMING	R	R
	P 1629 X PROP DEPLETION COF	R	R
	P 1631 X LO2 F&D VLV AIRB OPN	R	R
WD01	P 1631 X	2	2
	P 1632 X LO2 F&D VLV AIRB CLS	R	R
WD01	P 1632 X	2	2
	P 1633 X LO2 F&D VLV GND OPN	R	R
WD01	P 1633 X	2	2
	P 1634 X LO2 F&D VLV GND CLS	R	R
WD01	P 1634 X	2	2
	P 1635 X FUL F&D VLV AIRB OPN	R	R
	P 1636 X FUL F&D VLV AIRB CLS	R	R

D24 OBJ TEST PLAN

P 1637 X FUL F&D VLV GND OPN	R	R	
P 1638 X FUL F&D VLV GND CLS	R	R	
P 1987 X FUEL OVERFILL PROBE	R	R	
P 1988 X LO2 95% LVL EMER COF	R	R	
P 1997 X MSL FUELED 95%	R	R	
P 1998 X LO2 O/FILL EMERG	R	R	
P 1999 X MSL FUELED 100%	R	R	
S 1252 D B1 YAW			F
SD30 S 1252 D			2
S 1253 D B2 YAW			F
SD30 S 1253 D			2
S 1254 D B1 PITCH			F
SD30 S 1254 D			2
S 1255 D B2 PITCH			F
SD30 S 1255 D			2

D24 OBJ TEST PLAN

		DF	DF
	S 1107 V B1 PCH ACTR FEEDBAK		
HD22	S 1107 V	2	2
SD14	S 1107 V	1	1
SD30	S 1107 V		2
SD35	S 1107 V	2	2
	S 1108 V B2 PCH ACTR FEEDBAK		
HD22	S 1108 V	2	2
SD14	S 1108 V	1	1
SD30	S 1108 V		2
SD35	S 1108 V	2	2
	S 1113 V V1 YAW ACTR FEEDBACK		
HD33	S 1113 V	2	2
	S 1114 V V2 YAW ACTR FEEDBACK		
HD33	S 1114 V	2	2
	S 1118 V V2 PCH ACTR FEEDBACK		
HD33	S 1118 V	2	2
	S 1119 V V1 PCH ACTR FEEDBACK		
HD33	S 1119 V	2	2
	S 1122 V SERVO TEST SIG		
HD22	S 1122 V	2	2
HD23	S 1122 V	2	2
HD33	S 1122 V	2	2
SD14	S 1122 V	1	1
SD15	S 1122 V	1	1
SD30	S 1122 V		1
SD35	S 1122 V	1	1
	S 1128 V B1 YAW ACTR FEEDBAK		
HD22	S 1128 V	2	2
SD14	S 1128 V	1	1
SD30	S 1128 V		2

D24 OBJ TEST PLAN

SD35	S 1128 V	2	2
	S 1129 V B2 YAW ACTR FEEDBAK	DF	DF
HD22	S 1129 V	2	2
SD14	S 1129 V	1	1
SD30	S 1129 V		2
SD35	S 1129 V	2	2
	S 1147 V PITCH GYRO AMP OUT	F	F
SD34	S 1147 V	1	1
	S 1148 V YAW GYRO AMP OUT	F	F
SD34	S 1148 V	1	1
	S 1149 V ROLL GYRO AMP OUT	F	F
SD34	S 1149 V	1	1
	S 1216 V S PCH ACTR FEEDBACK	DF	DF
HD23	S 1216 V	2	2
SD15	S 1216 V	1	1
SD30	S 1216 V		2
SD35	S 1216 V	2	2
	S 1217 V S YAW ACTR FEEDBACK	DF	DF
HD23	S 1217 V	2	2
SD15	S 1217 V	1	1
SD30	S 1217 V		2
SD35	S 1217 V	2	2
	U 1080 P LO2 TANK HEAD	SF	SF
UD15	U 1080 P		1
UD20	U 1080 P	1	1
UD24	U 1080 P	1	1
	U 1081 P FUEL TANK HEAD	SF	SF
UD15	U 1081 P		1

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D24 OBJ TEST PLAN

UD20	U 1081 P	1	1
UD24	U 1081 P	1	1
	U 1174 T ACOUSTICA COMP TEMP	S	S
UD24	U 1174 T	2	2
	U 1091 V ERROR RATIO DEMOD OP	FS	FS
			2
UD15	U 1091 V	1	1
UD20	U 1091 V	1	1
WD01	U 1091 V	1	1
WD02	U 1091 V		2
WD09	U 1091 V		
	U 1113 V ACOUSTICA VLV POS FB	F	F
		1	1
PF3.	U 1113 V		
UD15	U 1113 V		1
UD24	U 1113 V	1	1
	U 1134 X AA TIME SHARD OSC OP	R	R
UD24	U 1134 X	2	2
	U 1135 X ACOUSTICA SNSRS 516	R	R
			1
FD37	U 1135 X		1
UD15	U 1135 X	2	2
UD24	U 1135 X		
	U 1148 X LO2 2 SNSRS STA 947		R
WD09	U 1148 X		2
	U 1149 X LO2 2 SNSRS STA 664		R

D24 OBJ TEST PLAN

WD05	U 1149 X	2
	U 1150 X LO2 2 SNSRS STA 758	R
WD05	U 1150 X	2
	U 1151 X LO2 2 SNSRS STA 836	R
WD05	U 1151 X	2
	U 1152 X LO2 2 SNSRS STA 888	R
WD05	U 1152 X	2
	U 1153 X LO2 2 SNSRS STA 910	R
WD05	U 1153 X	2
	U 1160 X FUL 2 SNSRS STA 944	R
WD05	U 1160 X	2
	U 1161 X FUL 2 SNSRS STA 1024	R
WD05	U 1161 X	2
	U 1162 X FUL 2 SNSRS STA 1083	R
WD05	U 1162 X	2
	U 1163 X FUL 2 SNSRS STA 1126	R
WD05	U 1163 X	2
	U 1164 X FUL 2 SNSRS STA 1241	R
WD05	U 1164 X	2
	U 1165 X FUL 2 SNSRS STA 1256	R
WD05	U 1165 X	2

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D24 S 1129 V		SD14	1	1	31144
D24 S 1216 V	S PCH ACTR FEEDBACK		DF	DF	
D24 S 1216 V		HD23	2	2	31176
D24 S 1216 V		SD11	1		31176
D24 S 1216 V		SD13	1		31176
D24 S 1216 V		SD15	1	1	31176
D24 S 1217 V	S YAW ACTR FEEDBACK		DF	DF	
D24 S 1217 V		HD23	2	2	31181
D24 S 1217 V		SD11	1		31181
D24 S 1217 V		SD13	1		31181
D24 S 1217 V		SD15	1	1	31181

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D24	U 1091 V	ERROR RATIO DEMOD OP		SF	SF	
D24	U 1091 V		UD15		1	26190
D24	U 1091 V		UD20	1	1	26190
D24	U 1091 V		WD01	1	1	26190
D24	U 1091 V		WD02	2	2	26190
D24	U 1113 V	ACOUSTICA VLV POS FB		F	F	
D24	U 1113 V		PD37		1	26208
D24	U 1113 V		UD15		1	26208
D24	U 1113 V		UD24	1	1	26208
D24	U 1113 V		WD05		1	26208
D24	U 1135 X	ACOUSTICA SNSRS SIG		F	F	
D24	U 1135 X		PD37		1	26206
D24	U 1135 X		UD15		1	26206
D24	U 1135 X		UD24	1	1	26206

D24 OBJECTIVE TEST PLAN 14MAY 59

D24	X 0000 X	TARE & RESTRAINTS			
D24	X 0000 X		AD10	X	X
D24	X 0000 X		AD11	X	X
D24	X 0000 X		LD11	X	X
D24	X 0000 X		LD15	X	
D24	X 0000 X		LD15		
D24	X 0000 X		MD12	X	X
D24	X 0000 X		ND10	X	X
D24	X 0000 X		OD10	X	X
D24	X 0000 X		OD10		
D24	X 0000 X		PD26	X	X
D24	X 0000 X		UD24	2	2

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SECTION 8

TEST PLAN BY OBJECTIVE

This section presents a grouping of the measurements required to support each test objective presently scheduled for this missile. In addition the priority of each measurement in regard to each test objective is defined for each test block. The following is a brief explanation of the format used in this section.

MEASUREMENT IDENTIFICATION

Two letters are included; the first denotes the system instrumented while the latter indicated the type of measurement. Of the four numerical digits the first is used to identify the method of signal transmission from the transducer to the recorder. The remaining three digits provide an identification for the measurement within the system denoted by the first letter. For example the circled measurement is P.U. system measurement number 91; a voltage measurement to be transmitted via the directline (landline) system.

BLOCK I EFFECTIVITY

An "X" in this column indicates that the objective is scheduled for Block I.

BLOCK II EFFECTIVITY

OBJECTIVE HEADER

This machine, usually abbreviated, description of the test objective.

MEASUREMENT DESCRIPTION

This is a brief, usually abbreviated, description of the measurement.

PROBLEM AREA CODE

This code, although not utilized in this section provides a means of grouping related measurements for instrumentation planning (IBM sorting).

		OXIDIZER TOPPING	PN04	X	X	2626
C 2	P 1018 T	B1 TURBINE INLET	PN04	2	2	23032
C 2	P 1021 T	LOX AT BREAKAWAY VLV	PN04	1	1	23390
C 2	U 1021 P	LOX TK HD Vibrotron	PN04	1	1	
C 2	U 1021 P	LOX TK HD VIBROTRON	PN04	1	1	26011
C 2	U 1091 V	ERROR RATIO DEMOD OP	PN04	1	1	26190

MISSILE IDENTIFICATION (TYPICAL)

Series/Missile Number

OBJECTIVE CODE

This code provides a means of grouping the measurements under the objective header (IBM sorting).

BLOCK I PRIORITY

This number defines the priority of the measurement during Block I testing in regard to the test objective it is listed under. Only those measurements required to achieve the objective are listed.

BLOCK II PRIORITY

Note: For a more detailed explanation of this format and a key to the abbreviations and coding see Appendix B in Section 12 of this report.

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D24 OBJ TEST PLAN

OBJ. CODE	DESCRIPTION	1	2
AD10	DEMONSTRATE THE STRUCTURAL INTEGRITY OF THE BOOSTER THRUST STRUCTURE.	2	2
	X 0000 X VISUAL INSPECTION	X	X
AD11	DEMONSTRATE THE ABILITY OF THE PROPELLANT TANKS TO WITHSTAMD THE VARIOUS LOADS IMPOSED DURING ENGINE STARTS, BOOSTER, AND SUSTAINER STAGE OPERATION.	2	2
	X 0000 X VISUAL INSPECTION	X	X
AD17	DETERMINE THE DB LEVELS IN THE POD & ENGINE COMPARTMENT AREAS	1	1
	A 1489 Y POD 1 SOUND PRESS	1	1
	A 1493 Y ENG COMP SOUND PRESS	1	1
ED15	DETERMINE PERFORMANCE ADEQUACY		1

D24 OBJ TEST PLAN

OF THE MISSILE ELECTRICAL SYSTEM DURING LONG DURATION RUNS. WITH REMOTELY ACTIVATED ONE-SHOT PRIMARY BATTERY.

	E 1005 Q INVERTER FREQUENCY		1
	E 1003 V BATTERY OUTPUT		1
	E 1006 V INVERTER PHASE A		1
FD33	DEMONSTRATE ADEQUACY OF THE AIRBORNE PNEUMATICS SYSTEM PERFORMANCE DURING A MULTI-STAGE CAPTIVE FIRING WITH D SERIES PRESSURE REGULATORS.	1	1
	F 1994 C DC TO BO VLV MOTOR	2	2
	F 1001 P LO2 TANK HELIUM	1	1
	F 1003 P FUEL TANK HELIUM	1	1
	F 1009 P FUEL REG DISCH	2	2
	F 1011 P LO2 PRESS REG DISCH	2	2
	F 1114 P LO2 PRESS REG INLET	2	2
	F 1125 P B CTL PNEU REG OUT	2	2
	F 1246 P BOOSTER TK HE BTL HI	2	2
	F 1268 P ST PNEU REG OUT	2	2
	F 1291 P S CTL HE BTL	2	2
	F 1115 T LO2 PRESS REG INLET	2	2
	F 1318 T ST PNEU REG IN	2	2
FD37	DETERMINE PERFORMANCE CHARACT-	1	1

D24 OBJ TEST PLAN

	ERISTICS OF THE PROPELLANT TANKS PRESSURIZATION REGULATORS. /F&G REGULATORS/.		
	F 1001 P LO2 TANK HELIUM	1	1
	F 1003 P FUEL TANK HELIUM	1	1
	F 1009 P FUEL PRESS REG DISCH	1	1
	F 1011 P LO2 PRESS REG DISCH	1	1
	F 1114 P LO2 PRESS REG INLET	2	2
	F 1246 P B TANK HE BOTTLES HI	2	2
	F 1115 T LO2 PRESS REG INLET	2	2
HD22	DEMONSTRATE THE PERFORMANCE OF THE BOOSTER STAGE HYDRAULIC SYSTEM.	1	1
	H 1033 P B1 HYD ACCUMULATOR	1	1
	S 1107 V B1 PCH ACTR FEEDBAK	2	2
	S 1108 V B2 PCH ACTR FEEDBAK	2	2
	S 1122 V SERVO TEST SIG	2	2
	S 1128 V B1 YAW ACTR FEEDBAK	2	2
	S 1129 V B2 YAW ACTR FEEDBAK	2	2
HD23	DEMONSTRATE PERFORMANCE OF THE SUSTAINER-VERNIER HYDRAULIC SYSTEM DURING BOOSTER STAGE OPERATION, STAGING, AND DURING SUSTAINER STAGE OPERATION.	1	1
	H 1140 P SUS/VERN HYD PRESS	1	1
	P 1528 D S MAIN FUEL VALVE	2	2

D24 OBJ TEST PLAN

	P 1929 D S MAIN LO2 VALVE	2	2
	S 1122 V SERVO TEST SIG	2	2
	S 1216 V S PCH ACTR FEEDBACK	2	2
	S 1217 V S YAW ACTR FEEDBACK	2	2
MD26	DEMONSTRATE SATISFACTORY SWITCHOVER OF HYDRAULIC POWER FROM THE GROUND SUPPLY TO THE AIRBORNE SYSTEM.	1	2
	M 1033 P B1 HYD ACCUMULATOR	1	1
	M 1140 P SUS/VERN HYD PRESS	1	1
MD33	DEMONSTRATE ADEQUACY OF THE VERNIER HYDRAULIC SYSTEM DURING A RUN WITH PROGRAM GIMBALING.	1	1
	M 1140 P SUS/VERN HYD PRESS	1	1
	S 1113 V V1 YAW ACTR FEEDBACK	2	2
	S 1114 V V2 YAW ACTR FEEDBACK	2	2
	S 1118 V V2 PCH ACTR FEEDBACK	2	2
	S 1119 V V1 PCH ACTR FEEDBACK	2	2
	S 1122 V SERVO TEST SIG	2	2
MD44	OBTAIN DATA ON THE OPERATION OF PRESSURE SWITCHES 80A & B1	2	2

D24 OBJ TEST PLAN

IN THE D SERIES GROUND HYDRAUL IC SUPPLY UNIT.

	H 1197 X GND HYD LO PRESS	1	1
	H 1198 X GND HYD HI PRESS	1	1
	H 1199 X GND HYD HI PRESS S&V	1	1
	H 1200 X GND HYD LO PRESS S&V	1	1
LD11	DEMONSTRATE ADEQUACY OF COMPATIBILITY OF APPLICABLE GSE AND OPERATING PROCEDURES.	2	2
	X 0000 X NO MEASUREMENTS REQ	X	X
LD13	OBTAIN DATA TO BE USED FOR THE DETERMINATION OF THE EFFECT OF A HOT FIRING ENVIRONMENT UPON THE ACCURACY OF THE LOAD CELL SYSTEM.	1	2
	N 1011 F WT & THST SYS THRUST	1	1
	X 0000 X FIELD STD LOG	X	X
LD15	OBTAIN DATA TO ASCERTAIN TARE AND RESTRAINTS.	1	
	N 1011 F WT & THST SYS-THRUST	2	
	X 0000 X FEILD STD LOG	X	
MD10	MAINTAIN A DETAILED LOG OF MISSILE TANKING AND PRESSURI-ZATION CYCLES.	2	2
	X 0000 X LOG OF TANKING CYCLE	X	X

D24 OBJ TEST PLAN

MD12	ESTABLISH MISSILE HANDLING, MATING, AND DEMATING PROCEDURES.	2	2
	X 0000 X NO MEASUREMENTS REQ	X	X
MD13	DEMONSTRATE THE ADEQUACY OF ALL PROCEDURES IN THE D SERIES FLIGHT COUNTDOWN.	1	2
	X 0000 X NO SPECIFIC MEAS REQ	X	X
MD10	DEMONSTRATE MISSILE SYSTEMS AND TEST FACILITIES COMPATIBILITY.	2	2
	X 0000 X MEAS AS REQ FOR	X	X
	X 0000 X SYSTEM CHECK OUT	X	X
	X 0000 X & 1A & 1B MEAS	X	X
OD10	OBTAIN DATA ON THE VARIOUS MISSILE SYSTEMS AND ASSOCIATED GROUND SUPPORT EQUIPMENT FOR RELIABILITY ANALYSIS.	2	2
	X 0000 X MEAS AS REQ AS PER	X	X
	X 0000 X OTHER OBJECTIVES	X	X
PD14	DETERMINE THE OPERATIONAL CHARACTERISTICS AND THE TRANSIENTS IN THE ENGINE START SYSTEM DURING PROPULSION SYSTEM START AND TRANSITION TO MAINSTAGE OPERATION.	1	2
	P 1083 B B2 PUMP SPEED	1	1
	P 1084 B B1 PUMP SPEED	1	1

D24 GBJ TEST PLAN

P 1349 B S PUMP SPEED	1	1
P 1006 P S THRUST CHAMBER	1	1
P 1026 P B LO2 REG REFERENCE	2	2
P 1027 P VERNIER FUEL TANK	1	1
P 1028 P V1 THRUST CHAMBER	1	1
P 1029 P V2 THRUST CHAMBER	1	1
P 1030 P VERNIER LO2 TANK	1	1
P 1047 P V1 LO2 INLET	2	2
P 1048 P V2 LO2 INLET	2.	2
P 1049 P V1 FUEL INLET	2	2
P 1050 P V2 FUEL INLET	2	2
P 1059 P B2 THRUST CHAMBER	1	1
P 1060 P B1 THRUST CHAMBER	1	1
P 1100 P B GG COMBUSTION CHM	2	2
P 1330 P S FUEL PUMP DISCH	1	1
P 1332 P S LO2 PUMP DISCH	1	1
P 1339 P S GAS GEN DISCH	2	2
P 1344 P S LO2 REG REFERENCE	2	2
P 1351 P S LO2 INJ MANIFOLD	2	2
P 1017 T B2 TURBINE INLET	2	2

D24 OBJ TEST PLAN

	P 1021 T LO2 AT BRKAWAY VLV	2	2
	P 1326 T S TURBINE INLET	2	2
	X 0000 X STANDARD SEQ MEAS	X	X
PD15	OBTAIN DATA ON OPERATING PARAMETERS THAT WILL PERMIT AN EXAMINATION OF THE BOOSTER ENGINE PERFORMANCE DURING CAPTIVE FIRINGS.	1	1
	P 1083 B B2 PUMP SPEED	1	1
	P 1084 B B1 PUMP SPEED	1	1
	P 1003 P B2 LO2 PUMP INLET	2	2
	P 1004 P B2 FUEL PUMP INLET	2	2
	P 1026 P B LO2 REG REFERENCE	2	2
	P 1059 P B2 THRUST CHAMBER	1	1
	P 1060 P B1 THRUST CHAMBER	1	1
	P 1100 P B B6 COMBUSTION CHM	2	2
	P 1017 T B2 TURBINE INLET	2	2
	P 1767 T B1 CHAMBER SK T	2	2
PD19	OBTAIN DATA ON THE OPERATING PARAMETERS THAT WILL PERMIT AN EXAMINATION OF THE PERFORMANCE OF THE VERNIER ENGINE DURING PUMP-FED AND TANK-FED	1	1

D24 OBJ TEST PLAN

OPERATIONS.	1	1
P 1349 B S PUMP SPEED	1	1
P 1027 P VERNIER FUEL TANK	1	1
P 1028 P V1 THRUST CHAMBER	1	1
P 1029 P V2 THRUST CHAMBER	1	1
P 1030 P VERNIER LO2 TANK	1	1
P 1047 P V1 LO2 INLET	1	1
P 1048 P V2 LO2 INLET	1	1
P 1049 P V1 FUEL INLET	1	1
P 1050 P V2 FUEL INLET	1	1
P 1330 P S FUEL PUMP DISCH	1	1
P 1352 P S LO2 PUMP DISCH	1	1
PD23 DETERMINE FLOW CHARACTERISTICS AND TRANSIENTS IN THE VERNIER FEED SYSTEM DURING THE CHANGE FROM TANK-FED TO PUMP-FED OPER ATION AT PROPULSION SYSTEM START AND FROM PUMP-FED TO TANK-FED OPERATION AT SUS- TAINER STAGING.	1	1
P 1349 B S PUMP SPEED	1	1
P 1027 P VERNIER FUEL TANK	1	1
P 1028 P V1 THRUST CHAMBER	2	2
P 1029 P V2 THRUST CHAMBER	2	2
P 1030 P VERNIER LO2 TANK	1	1
P 1047 P V1 LO2 INLET	1	1

D24 OBJ TEST PLAN

	P 1048 P V2 LO2 INLET	1	1
	P 1049 P V1 FUEL INLET	1	1
	P 1050 P V2 FUEL INLET	1	1
	P 1330 P S FUEL PUMP DISCH	2	2
	P 1332 P S LO2 PUMP DISCH	2	2
	P 1351 P S LO2 INJ MANIFOLD	2	2
PD26	DEMONSTRATE THE STRUCTURAL INTEGRITY OF THE BOOSTER, SUSTAINER, AND VERNIER PROPELLANT FEED DUCTING.	1	2
	X 0000 X VISUAL INSPECTION	X	X
PD28	DEMONSTRATE COMPATIBILITY BETWEEN THE PROPULSION SYSTEM AND TEST SUPPORT EQUIPMENT PRIOR TO MAKING LONG DURATION RUNS.	1	
	P 1083 B S2 PUMP SPEED	1	
	P 1084 B S1 PUMP SPEED	1	
	P 1349 B PUMP SPEED	1	
	P 1328 D S MAIN FUEL VALVE	1	
	P 1329 D S MAIN LO2 VALVE	1	
	P 1006 P S THRUST CHAMBER	1	
	P 1026 P S LO2 REG REFERENCE	1	

D24 OBJ TEST PLAN

P 1027 P VERNIER FUEL TANK	1		
P 1028 P V1 THRUST CHAMBER	1		
P 1029 P V2 THRUST CHAMBER	1		
P 1030 P VERNIER LO2 TANK	1		
P 1047 P V1 LO2 INLET	1		
P 1048 P V2 LO2 INLET	1		
P 1049 P V1 FUEL INLET	1		
P 1050 P V2 FUEL INLET	1		
P 1059 P B2 THRUST CHAMBER	1		
P 1060 P B1 THRUST CHAMBER	1		
P 1100 P S GG COMBUSTION CHAM	1		
P 1330 P S FUEL PUMP DISCH	1		
P 1332 P S LO2 PUMP DISCH	1		
P 1339 P S GAS GEN DISCH	1		
P 1344 P S LO2 REG REF	1		
P 1017 T B2 TURBINE INLET	1		
P 1326 T S TURBINE INLET	1		
PD29 OBTAIN DATA ON THE OPERATIONAL THRUST RISE CHARACTERISTICS OF THE MA-2 PROPULSION SYSTEM.	1	1	
N 1011 F WT S THST SYS-THRUST	1	1	

D24 OBJ TEST PLAN

P 1083 B B2 PUMP SPEED	2	2
P 1084 B B1 PUMP SPEED	2	2
P 1349 B S PUMP SPEED	2	2
P 1439 O S MAA RCC ACCEL	2	2
P 1452 O B1 MAA RCC ACCEL	2	2
P 1453 O B2 MAA RCC ACCEL	2	2
P 1006 P S THRUST CHAMBER	1	1
P 1028 P V1 THRUST CHAMBER	1	1
P 1029 P V2 THRUST CHAMBER	1	1
P 1030 P VERNIER LO2 TANK	1	1
P 1055 P S FUEL PUMP INLET	2	2
P 1059 P B2 THRUST CHAMBER	1	1
P 1060 P B1 THRUST CHAMBER	1	1
P 1100 P B GG COMBUSTION CHM	2	2
P 1339 P S GAS GEN DISCH	2	2
P 1021 T LO2 AT BRKAWAY VLV	1	1
PD37 DETERMINE CAPTIVE SEA LEVEL PERFORMANCE CHARACTERISTICS OF THE SUSTAINER ENGINE WITH THE PU VALVE CONTROLLED BY THE ACOUSTICA PU SYSTEM.	1	1
P 1349 B S PUMP SPEED	1	1

D24 OBJ TEST PLAN

P 1528 D S MAIN FUEL VALVE		1	1
P 1529 D S MAIN LO2 VALVE		2	2
P 1006 P S THRUST CHAMBER		1	1
P 1055 P S FUEL PUMP INLET		2	2
P 1056 P S LO2 PUMP INLET		2	2
P 1330 P S FUEL PUMP DISCH		2	2
P 1332 P S LO2 PUMP DISCH		2	2
P 1339 P S GAS GEN DISCH		2	2
P 1351 P S LO2 INJ MANIFOLD		2	2
U 1113 Y ACOUSTICA VLV POS FB		1	1
U 1135 X ACOUSTICA SNSRS SIG			1
PD59	DEMONSTRATE OPERATION OF IOC TYPE THRUST CHAMBER BLOW OFF COVERS.		2
X 0000 X PHOTO COVERAGE			2
PD64	ESTABLISH POST-FIRING PURGE & FLUSH PROCEDURE FOR IOC USE.	1	2
X 0000 X NO SPECIFIC INSTR		X	X
PD65	DETERMINE TEMPERATURE ENVIRONMENT OF BOOSTER FUEL PURGE LINE.	1	

D24 OBJ TEST PLAN

	P 1764 T B1 PRG LN NEAR BLKHD	1	
	P 1768 T B1 PRG LN @ ENG MAN	1	
SD14	DETERMINE THE DYNAMIC RESPONSE OF THE BOOSTER SERVO LOOP.	1	1
	E 1005 Q INVERTER OUTPUT	2	2
	E 1029 Q INVERTER FREQUENCY	2	2
	E 1006 V INVERTER PHASE A	2	2
	H 1033 P B1 HYD ACCUMULATOR	2	2
	S 1107 V B1 PCH ACTR FEEDBAK	1	1
	S 1108 V B2 PCH ACTR FEEDBAK	1	1
	S 1122 V SERVO TEST SIG	1	1
	S 1128 V B1 YAW ACTR FEEDBAK	1	1
	S 1129 V B2 YAW ACTR FEEDBAK	1	1
SD15	DETERMINE THE DYNAMIC RESPONSE OF THE SUSTAINER SERVO LOOP.	1	1
	E 1005 Q INVERTER OUTPUT	2	2
	E 1029 Q INVERTER FREQUENCY	2	2
	E 1006 V INVERTER PHASE A	2	2
	H 1140 P SUS/VERN HYD PRESS	2	2
	S 1122 V SERVO TEST SIG	1	1

D24 OBJ TEST PLAN

	S 1216 V S PCH ACTR FEEDBACK	1	1
	S 1217 V S YAW ACTR FEEDBACK	1	1
SD30	OBTAIN DATA ON BOOSTER AND SUSTAINER GIMBAL BLOCK FRICTION DURING HOT AND COLD RUNS.		1
	H 1206 P B1 PCH ACTR EXTEND		1
	H 1207 P B1 PCH ACTR RETRACT		1
	H 1208 P B1 YAW ACTR EXTEND		1
	H 1209 P B1 YAW ACTR RETRACT		1
	S 1252 D B1 YAW		2
	S 1253 D B2 YAW		2
	S 1254 D B1 PITCH		2
	S 1255 D B2 PITCH		2
	S 1107 V B1 PCH ACTR FEEDBAK		2
	S 1108 V B2 PCH ACTR FEEDBAK		2
	S 1122 V SERVO TEST SIG		1
	S 1128 V B1 YAW ACTR FEEDBAK		2
	S 1129 V B2 YAW ACTR FEEDBAK		2
	S 1216 V S PCH ACTR FEEDBACK		2
	S 1217 V S YAW ACTR FEEDBACK		2

D24 OBJ TEST PLAN

SD34	OBTAIN DATA GYRO NOISE CHACTERISTICS DURING ENGINE GIMBALING	1	1
	S 1147 V PITCH GYRO AMP OUT	1	1
	S 1148 V YAW GYRO AMP OUT	1	1
	S 1149 V ROLL GYRO AMP OUT	1	1
SD35	DETERMINE EFFECT ON THRUST CHAMBER GIMBALING RESULTING FROM INCORPORATION OF STABILIZATION FILTERS		1
	S 1107 V B1 PCH ACTR FEEDBAK	2	2
	S 1108 V B2 PCH ACTR FEEDBAK	2	2
	S 1122 V SERVO TEST SIG	1	1
	S 1128 V B1 YAW ACTR FEEDBAK	2	2
	S 1129 V B2 YAW ACTR FEEDBAK	2	2
	S 1216 V S PCH ACTR FEEDBAK	2	2
	S 1217 V S YAW ACTR FEEDBAK	2	2
UD15	DETERMINE THE CAPABILITY OF THE ACOUSTICA PU SYSTEM WHILE CONTROLLING THE MISSILE PU		1

D24 OBJ TEST PLAN

VALVE DURING LONG DURATION MULTI-STAGE CAPTIVE FIRING.

P 1287 D	ACOUSTIC FUL VLV XDR		1
P 1529 D S	MAIN LO2 VALVE		2
P 1682 P	PRESS DIFF ON LO2 TK		2
P 1683 P	PRESS DIFF ON FUL TK		2
U 1080 P	LO2 TANK HEAD		1
U 1081 P	FUEL TANK HEAD		1
U 1091 V	ERROR RATIO DEMOD OP		2
U 1113 V	ACOUSTICA VLV POS FB		1
U 1135 X	ACOUSTICA SNSRS SIG		1

UD20	DETERMINE THE CAPABILITY OF THE CONVAIR PU SYSTEM IN CONTROLLING THE RATIO OF RESIDUAL PROPELLANTS DURING D SERIES CAPTIVE FIRINGS.	1	1
N 1011 F	WT & THST SYS-THRUST	1	1
P 1528 D S	MAIN FUEL VALVE	1	1
P 1529 D S	MAIN LO2 VALVE	2	2
U 1080 P	LO2 TANK HEAD	1	1
U 1081 P	FUEL TANK HEAD	1	1
U 1091 V	ERROR RATIO DEMOD OP	1	1
UD24	OBTAIN DATA ON THE OUTPUTS OF	1	1

D24 OBJ TEST PLAN

THE ACOUSTICA TANK LEVEL SENSORS AND OBTAIN COMPUTER DATA TO DETERMINE SYSTEM CAPABILITY AND FUNCTIONAL ADEQUACY DURING A LONG DURATION D SERIES CAPTIVE TEST. /OPEN LOOP CONFIGURATION/

N 1011 F WT & THST SYS-THRUST	2	2
N 1971 X AA 99.8% FUEL PROBE	2	2
N 1972 X AA 100.2% FUEL PROBE	2	2
N 1976 X AA LO2 BU FINE SIG	2	2
N 1977 X AA LO2 TOPG COF SIG	2	2
N 1978 X AA LO2 EMG SIG	2	2
P 1287 D ACOUSTC FUL VLV XDCR	2	2
P 1682 P PRESS DIFF ON LO2 TK	2	2
P 1683 P PRESS DIFF FUEL TK	2	2
U 1080 P LO2 TANK HEAD	1	1
U 1081 P FUEL TANK HEAD	1	1
U 1174 T ACOUSTICA COMP TEMP	2	2
U 1113 V ACOUSTICA V FB	1	1
U 1134 X AA TIME SHARD OSC OP	2	2
U 1135 X ACOUSTICA SNSRS SIG	2	2
X 0000 X STANDARD SEQ MEAS	2	2

D24 OBJ TEST PLAN

WD01	DEMONSTRATE THE LO2 TANKING PROCEDURE UTILIZING TANKING FACILITIES INCORPORATING SUB-COOLED LO2 TOPPING CAPABILITIES.	2	2
	N 1011 F WT & THST SYS-THRUST	1	1
	P 1682 P PRESS DIFF ON LO2 TK	1	1
	P 1683 P PRESS DIFF FUEL TK	2	2
	P 1021 T LO2 AT BRKAWAY VLV	2	2
	P 1631 X LO2 F&D VLV AIRB OPN	2	2
	P 1632 X LO2 F&D VLV AIRB CLS	2	2
	P 1633 X LO2 F&D VLV GND OPN	2	2
	P 1634 X LO2 F&D VLV GND CLS	2	2
	U 1091 V ERROR RATIO DEMOD OP	1	1
WD02	DETERMINE THE ACCURACY OF THE CONVAIR PROPELLANT LOADING CONTROL SYSTEM IN LOADING THE MISSILE TO PROPER D SERIES LEVELS.	1	1
	F 1001 P LO2 TANK HELIUM	2	2
	F 1001 P LO2 TANK HELIUM	2	2
	F 1003 P FUEL TANK HELIUM	2	2
	N 1011 F WT & THST SYS-THRUST	1	1
	P 1682 P PRESS DIFF LO2 TK	1	1
	P 1683 P PRESS DIFF FUEL TK	1	1
	U 1091 V ERROR RATIO DEMOD OP	1	1

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D24 OBJ TEST PLAN

WD05	DETERMINE THE ACCURACY OF THE ACOUSTICA PROPELLANT LOADING SYSTEM IN LOADING THE MISSILE TO PROPER D SERIES LEVELS.	1
	F 1001 P LO2 TANK HELIUM	2
	N 1011 F WT & THST SYS-THRUST	1
	N 1971 X AA 99.8% FUEL PROBE	1
	N 1972 X AA 100.2% FUEL PROBE	1
	N 1976 X AA LO2 BU FINE SIG	1
	N 1977 X AA LO2 TOPG COF SIG	1
	N 1978 X AA LO2 EMG SIG	1
	P 1682 P PRESS DIFF ON LO2 TK	2
	P 1683 P PRESS DIFF FUEL TK	2
	U 1091 V ERROR RATIO DEMOD OP	2
	U 1148 X LO2 2 SNSRS STA 547	2
	U 1149 X LO2 2 SNSRS STA 664	2
	U 1150 X LO2 2 SNSRS STA 798	2
	U 1151 X LO2 2 SNSRS STA 836	2
	U 1152 X LO2 2 SNSRS STA 888	2
	U 1153 X LO2 2 SNSRS STA 910	2
	U 1160 X FUL 2 SNSRS STA 944	2
	U 1161 X FUL 2 SNSRS STA 1024	2
	U 1162 X FUL 2 SNSRS STA 1083	2
	U 1163 X FUL 2 SNSRS STA 1126	2

D24 OBJ TEST PLAN

U 1164 X FUL 2 SNSRS STA 1141	2	
U 1165 X FUL 2 SNSRS STA 1156	2	
00 FIXED REQUIREMENTS		
01 MONITOR		
F 1003 P FUEL TANK HELIUM	1A 1A 1A	
F 1125 P B CTL PNEU REG OUT	1A 1A 1A	
F 1246 P B TK HE BTL HI	1A 1A 1A	
F 1288 P ST PNEU REG OUT	1A 1A 1A	
P 1328 D S MAIN FUEL VALVE	1A 1A 1A	
P 1010 P B1 LUBE OIL INJ MAN	1A 1A 1A	
P 1026 P B LO2 REG REFERENCE	1A 1A 1A	
F 1291 P S CTL HE BTL	1A 1A 1A	
P 1341 P S LUBE OIL MANIFOLD	1A 1A 1A	
P 1344 P S LO2 REG REFERENCE	1A 1A 1A	
P 1465 P S LO2 PR LUB OIL MAN	1A 1A 1A	
P 1017 T B2 TURBINE INLET	1A 1A 1A	
P 1326 T S TURBINE INLET	1A 1A 1A	
P 1673 T B1 FUEL IGN VLV AMB	1A 1A 1A	
P 1674 T B2 FUEL IGN VLV AMB	1A 1A 1A	
P 1675 T ENG CTL PNEU MAN AMB	1A 1A 1A	

D24 OBJ TEST PLAN

	P 1677 T FIRE DETECTOR EDISON	1A	1A	1A
02	POST TEST INSPECTION			
	P 1083 B B2 PUMP SPEED	1B	1B	1B
	P 1084 B B1 PUMP SPEED	1B	1B	1B
	P 1349 B S PUMP SPEED	1B	1B	1B
	P 1006 P S THRUST CHAMBER	1B	1B	1B
	P 1028 P V1 THRUST CHAMBER	1B	1B	1B
	P 1029 P V2 THRUST CHAMBER	1B	1B	1B
	P 1056 P S LO2 PUMP INLET	1B	1B	1B
	P 1059 P B2 THRUST CHAMBER	1B	1B	1B
	P 1060 P B1 THRUST CHAMBER	1B	1B	1B
	P 1091 P B1 LO2 INJ MANIFOLD	1B	1B	1B
	P 1092 P B2 LO2 INJ MANIFOLD	1B	1B	1B
	P 1093 P B1 FUEL INJ MANIFOLD	1B	1B	1B
	P 1094 P B2 FUEL INJ MANIFOLD	1B	1B	1B
	P 1230 P S FUEL PUMP DISCH	1B	1B	1B
	P 1250 P S FUEL INJ MANIFOLD	1B	1B	1B
	P 1251 P S LO2 INJ MANIFOLD	1B	1B	1B

SECTION 11

APPENDIX A

SERIES D PEN ASSIGNMENTS

For ease of data reduction and clarity of communication, it has been desirable to standardize pen number assignments to the bulk of the sequence (on-off) measurements during this series testing. This section presents these standardized measurements and their pen assignments. The measurements listed in this section are not shown elsewhere in this report.

The following is a brief explanation of the format used in this section.

Measurement Identification

Two letters are included, the first denotes the system instrumented while the later indicates the type of measurement. Of the four numberical digits the first is used to identify the method of signal transmission from the transducer to the recorder. While the remaining three provide an identification of the measurement within the system indicated by the first letter.

Pen Number

This denotes the sequence recorder pen assignment for the measurement.

P 1061 X	IGN STAGE TIMER CONT	P11-B	PEN 06	
P 1066 X	IGN FUEL V OPEN CTL	P11-E	PEN 08	
P 1105 X	SUSTAINER REV SOL B	P11-/P/	PEN 07	O
P 1109 X	S LOX REV CLSD MSW	P1-E	PEN 08	O

Measurement Description

This is a brief, usually abbreviated, description of the measurement.

Oscillograph

An "O" in this column indicates that in addition to being recorded on a sequence recorder the measurement should be recorded on an oscillograph channel.

Pick-up Point

This indicates the electrical plug number and pin letter of the pick-up point provided in the electrical control system for this measurement. Small letters are enclosed by slashes in this section to differentiate them from large letters.

NOTE: For a more detailed explanation of this format and a key to abbreviations and coding see Appendix B in section 16 of this report.

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SERIES D PEN NUMBER 14 MAY 1959 PAGE 001

SYS	MAN SO	TYPE	DESCRIPTION	PLUG	PIN	PEN NO
			TIMING PIP		PEN	1
P	1137	X	ETP PREP COMPLETE LT	P1	-H	PEN 4
P	1575	X	PRE START READY	P1	-J	PEN 5
P	1161	X	TCC START SWITCH	P1	-K	PEN 6
P	1608	X	ENG TANKS PRES	P10	-/E/	PEN 7
P	1609	X	ENG FUEL TK PRESD	P11	-V	PEN 8
P	1610	X	ENG LO2 TK PRESD	P11	-/K/	PEN 9
P	1441	X	IGNITION STAGE TIMER	P11	-W	PEN 10
P	1611	X	MAIN IGNITION START	P11	-/C/	PEN 11
P	1612	X	GG IGN LINK PILOT	P11	-/E/	PEN 12
P	1073	X	V1 PV CLOSED MSW	P1	-N	PEN 13
P	1172	X	V1 PV OPEN MSW	P1	-P	PEN 14
P	1074	X	V2 PV CLOSED MSW	P1	-R	PEN 15
P	1174	X	V2 PV OPEN MSW	P1	-S	PEN 16
P	1613	X	V1 P CHM SWITCH ON	P11	-/G/	PEN 17
P	1614	X	V2 P CHM SWITCH ON	P11	-/H/	PEN 18
P	1598	X	VERNIER ENG CUTOFF	P11	-/W/	PEN 19
			TIMING PIP		PEN	21
P	1621	X	IGN STAGE VLVS	P1	-U	PEN 22
P	1068	X	B1 LO2 VLV CLSD MSW	P1	-V	PEN 23
P	1170	X	B1 LO2 VLV OPEN MSW	P11	-X	PEN 24

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SERIES D PEN NUMBER 14 MAY 1959 PAGE 002

P 1067 X	B2 LO2 VLV CLSD MSW	P1-W	PEN	25
P 1169 X	B2 LO2 VLV OPEN MSW	P11-Z	PEN	26
P 1616 X	B FLIGHT LOCKIN	P14-E	PEN	27
P 1617 X	MAIN STAGE LIMITER	P1-Z	PEN	28
P 1070 X	B1 FUEL VLV CLSD MSW	P1-/E/	PEN	29
P 1194 X	B1 FUEL VLV OPEN MSW	P1-/F/	PEN	30
P 1069 X	B2 FUEL VLV CLSD MSW	P1-/G/	PEN	31
P 1195 X	B2 FUEL VLV OPEN MSW	P1-/H/	PEN	32
P 1071 X	B GG VLV CLOSED MSW	P1-/A/	PEN	33
P 1147 X	B GG VLV OPEN MSW	P1-/B/	PEN	34
P 1618 X	BU FUEL MAN P SW ON	P11-T	PEN	35
P 1619 X	B2 FUEL MAN P SW ON	P11-U	PEN	36
P 1992 X	BOOSTER ENG CUTOFF	P11-/Y/	PEN	37
	TIMING PIP		PEN	41
P 1621 X	IGN STAGE VLVS	P1-U	PEN	42
P 1199 X	S LO2 MSV CLSD MSW	P1-X	PEN	43
P 1198 X	S LO2 MSV OPEN MSW	P11-/A/	PEN	44
P 1622 X	S FLIGHT LOCKIN	P10-S	PEN	45
P 1203 X	S FUEL PUV CLSD MSW	P1-/J/	PEN	46
P 1202 X	S FUEL PUV OPEN MSW	P1-/K/	PEN	47
P 1335 X	SGG VLV CLSD MSW	P1-/C/	PEN	48
P 1499 X	SGG VLV OPEN MSW	P1-/D/	PEN	49

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P 1623 X	S FUEL MAN P SW ON	P11-S	PEN	50
P 1624 X	MAIN ENGS COMPLETE	P1-/M/	PEN	51
P 1596 X	PRE-RLS COF DISARM	P11-/Z/	PEN	52
P 1593 X	SUSTAINER ENG CUTOFF	P11-/X/	PEN	54
P 1627 X	MAIN ENG TH COMPLETE	P11-/P/	PEN	56
	TIMING PIP		PEN	61
P 1072 X	BOOSTER CUTOFF RELAY	P14-P	PEN	62
P 1347 X	S CUTOFF RELAY	P14-M	PEN	63
P 1077 X	VERNIER CUTOFF RELAY	P14-A	PEN	64
P 1154 X	TCC B ENGINE COF SW	P1-/N/	PEN	65
P 1594 X	TCC SUSTAINER COF SW	P1-/P/	PEN	66
P 1164 X	TCC VERN ENG COF SW	P1-/R/	PEN	67
P 1628 X	IGN STAGE LIM COF	P11-/S/	PEN	68
P 1155 X	OBSERVER CUTOFF	P1-/S/	PEN	69
P 1566 X	DC GND PWR FAIL COF	P11-/D/	PEN	70
P 1157 X	B2 TBN OVRSPEED TRIP	P11-/U/	PEN	71
P 1588 X	S TBN OVERSPEED TRIP	P11-/V/	PEN	72
P 1630 X	MAIN STAGE LIM COF	P11-R	PEN	74
P 1158 X	PREP INCOMPLETE COF	P11-/B/	PEN	75
P 1192 X	B1 ROUGH COMB COF		PEN	76
P 1193 X	B2 ROUGH COMB COF		PEN	77
P 1438 X	S ROUGH COMB COF		PEN	78

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	TIMING PIP		PEN 81
P 1445 X	B FUEL PRE VLV OPEN		PEN 82
P 1446 X	B FUEL PRE VLV CLSD		PEN 83
P 1381 X	S FUEL PRE VLV OPEN		PEN 84
P 1380 X	S FUEL PRE VLV CLSD		PEN 85
P 1686 X	B6566 LO2 PURGE	P104-A	PEN 93
P 1687 X	B6566 FUEL PURGE	P104-P	PEN 94
P 1688 X	VERNIER ENGINE PURGE	P104-T	PEN 95
	TIMING PIP		PEN 101

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APPENDIX B

D SERIES
IBM CODE KEY

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APPENDIX

INSTRUMENTATION CONFIGURATION

IBM CODE KEY

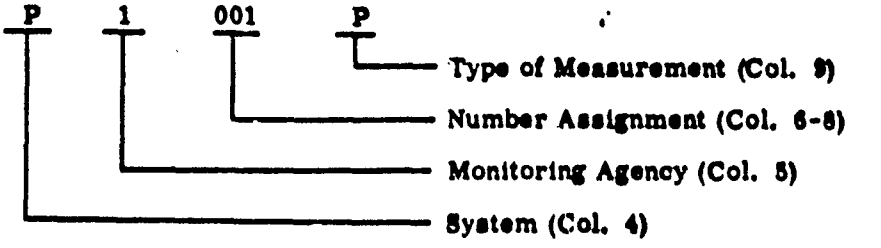
Master tabulations of all performance measurements applicable to all test articles are maintained by the Test Evaluation Group. Operational tabulations are compiled from these masters for individual missiles. All instrumentation logs are maintained on IBM punched cards. This facilitates rapid sorting, rearrangement, and tabulation of measurements as required for program preparation and data analysis. Such storage necessitates a systematic classification of the measurements and uniformity in method used to describe the many types of measurements. To achieve this, an extensive coding of the identification, description, and measurement parameters is necessary. The following is an explanation and key for this coding. Each section may be identified in the key by the section heading or the IBM card column number.

I. MISSILE IDENTIFICATION (Col. 1-3)

This section is used to present the missile series (Col. 1) and missile number (Col. 2-3).

II. MEASUREMENT IDENTIFICATION (Col. 4-9)

A. Each measurement has a unique six-character identification. The first character defines the system within which the measurement exists. The second character defines the monitoring agency. The third, fourth, and fifth characters are number assignments which define a particular measurement within the system defined by the first character. The sixth character defines the type of measurement.



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SYMBOL	SYSTEM (Col. 4)	TYPE OF MEASUREMENT (Col. 9)
A	Airframe	Acceleration
B	Range Safety Beacon	Rotation Rate
C	*	Current
D	Range Safety Command	Deflection
E	Electrical	Power
F	Pressurization	Force
G	Guidance (Radio)	*
H	Hydraulic	Position
I	Guidance (Inertial)	Intensity
L	Launcher	Velocity
M	Miscellaneous	Mass
N	Facilities and Site	*
O	*	Vibration
P	Propulsion	Pressure
Q	*	Frequency
R	*	Rate
S	Flight Control System (Servo)	Strain
T	Telemetering	Temperature
U	Propellant Utilization	*
V	*	Voltage
W	*	Time
X	External	Discrete Position
Y	Nose Cone	Accoustical
Z	AZUSA Transponder	Azimuth

*Note: Unassigned

MONITORING AGENCY (Col. 5)

0 Telemetering
1 Direct Line (Captive Test & AFMTC Landline)
3 Checkout and Validation Instrumentation
8 Visual Panel Presentations

III. MEASUREMENT DESCRIPTION (Col. 10-29)

Commonly used terminology is abbreviated as indicated in the List of Abbreviations at the end of this report.

IV. MEASUREMENT RANGE (Col. 35-42)

This represents the desired capability of the measuring system. "M" preceding a number indicates minus quantity.

V. UNITS OF FUNCTION (Col. 43-45)

AMP	Amperes	LBS	Pounds
CPS	Cycles per second	MA	Milliamperes
DB	Decibles	MC	Megacycles
DBM	Decibles above 1 Milliwatts	ME	Milliwatts
DEG	Degrees Angular	MII	Microinches per inch
DGC	Degrees Centigrade	MS	Milliseconds
DGF	Degrees Fahrenheit	MV	Millivolts
DGR	Degrees Rankine	PIA	Pounds per square inch absolute
D/S	Degrees per second	PID	Pounds per square inch differential
E	Watts		
F/S	Feet per second	PIG	Pounds per square inch gage
FS^2	Feet per second^2	PPS	Pulses per second
FTN	Foot ton	PS	Pounds per second
G	Acceleration of Gravity	PSI	Pounds per square inch
GPM	Gallons per minute	RPM	Revolutions per minute
GPS	Gallons per second	RS^2	Radians per second^2
IN	Inches	SF^2	Slugs feet^2
INW	Inches of water	SLG	Slugs
ILB	Inch pounds	SPS	Samples per second
IPI	Inches per inch	UV	Microvolts
KC	Kilocycles	UA	Microamperes
KID	Thousands of pound per square in. differential	VAC	Volts, alternating current
		VDC	Volts, direct current
KPS	Kilo-pounds	VPK	Peak volts, AC
KPM	Thousands of RPM's	PRV	Phase reversing AC voltage

VI. FREQUENCY RESPONSE REQUIRED (Col. 49-51)

The required response of the measuring system in cycles per second unless otherwise noted or implied.

SLO	Less than 1 cycle per second
400	400 cycles per second
1KC	1 Kilocycle (1000 cycles) per second
2MC	2 Megacycles (2,000,000 cycles) per second
STP	Step Function
UNK	Unknown

VII. TYPE OF TRANSDUCER (Col. 52-61)

*Indicates an "off the shelf" commercial transducer. This is followed by a coded identification of the vendor and the vendor model number if known.

Vendor Code

WK	Wianco Engineering Co.	BLH	Baldwin-Lima Hamilton
MASSA	Massa Laboratories, Inc.	T	Thermo Electric Co., Inc.
R-D	Rocketdyne	WAUGH	Waugh Engineering Co.

☐ Indicates the transducer is the same one as that used for the measurement number immediately following this symbol.

VIII. TRANSDUCER SERIAL NUMBER (Col. 62-66)

IX. TRANSDUCER LOCATION (Col. 67-70)

Station Number (Col. 67-70)

Location by station number to the nearest inch.

Quadrant Number (Col. 71)

1	Quadrant I
2	Quadrant II
3	Quadrant III
4	Quadrant IV
X	XX Axis
Y	YY Axis

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FOR LANDLINE AND CAPTIVE TEST

X. TYPE OF RECORDER (Col. 30-34)

A	AM tape
D	Sanborn type recorder
E	Eput meter, counter
F	FM tape
G	Esterline-Angus-Type-AW Graphic Recorder
L	Panel Light
M	Miscellaneous
O	Oscillograph (CEC)
P	Printer
R	EA Sequence Recorder
S	Strip chart (Brown, Speedomax)
V	Visual panel gage

FOR TELEMETERING ONLY

XI. MEASUREMENT CHANNEL ASSIGNMENTS (Col. 30-34, on TLM only)

Telemeter transmitter number (Col. 30)

Subcarrier channel numbers (Col. 31-32)

1-13, A, C, E

Pin number (Col. 33-34)

Pin number if commutated in telemeter package

Pin number 1 thru 60

TYPE OF MEASUREMENT (Col. 76, on TLM only)

P Primary - An original measurement with one transducer, the output of which is sent to only one telemetering package.

M Multiple - When a measurement is picked up by one transducer but sent over two or more telemetering packages the original measurement is considered primary and the repeated ones considered multiple.

SPECIAL CODING (Col. 76, on TLM only)

C Installation Drawing/Wiring Diagram
(Signal available will be shown in tabulation section 15)
(Output impedance will be shown in tabulation section 15)

XII. INSTRUMENTATION TEST PLAN

A. Measurement Functions (Col 31-34)

Functions are assigned two or four digit codes and are classified as (1) operational requirements, (2) Post Test Failure Detection Requirements or (3) Test Objectives.

1. Operational Requirements

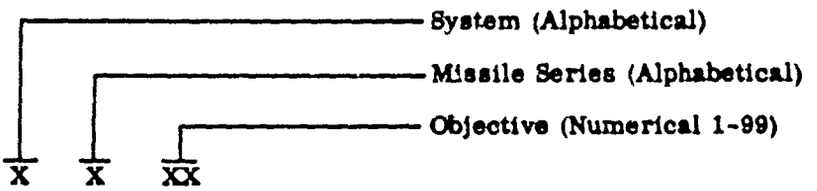
Operational measurements are those required on a continuing basis for checkout of the missile during the countdown and for safe operation during start, running, and shutdown of a hot firing. These measurements must be presented on a visual display, all others have no such requirement. Operational measurements are indicated by the two digit code (01).

2. Post Test Failure Detection Requirements

This measurement function includes those measurements which will provide "quick look" type of post test data necessary to detect a possible malfunction. Analysis of this data should indicate an unsafe firing condition. These measurements are indicated by the two digit code (02).

3. Test Objectives

a. Coding System: The coding system for test objectives has been developed to provide a rapid means of identification and handling of a large number of objectives. Coded objectives are listed by system along with the instrumentation required for accomplishment.



b. Letters used to identify the system are identical to those used to identify the system described in Section II of the code key with the following addition:

o - overall general objectives
i.e. Reliability, Compatibility
w - propellant loading

c. Objectives Headers

(1) The instrumentation test plan presents a tabulation of measurements by test objectives. These test objectives have necessarily been abbreviated to fit the IBM format which limits the entire header to 20 digits.

(2) Each objective header will contain one of the following five key terms. These terms defined below will establish a standard datum for uniform interpretation of test objectives.

DEMONSTRATE (DEM) denotes the occurrence of an action or an event during a test. The accomplishment of this type objective requires a qualitative answer. The answer will be derived through the relation of this action or event to some other known information or occurrence. This category of objective implies a minimum of airborne instrumentation, and/or that the information be obtained external to the missile.

DETERMINE (DET) denotes the measuring of performance of any unit or system. This category implies the quantitative investigation of overall operation which includes, generally, instrumentation for measuring basic inputs and outputs of the unit or system. The information obtained should indicate to what

extent the system is operating as designed. The instrumentation should allow performance deficiencies to be isolated to either the system or to the system inputs.

EVALUATE (EVAL) denotes the measuring of over-all performance of any unit or system as well as the performance and/or interaction of its sections or subsystems that are under investigation.

The accomplishment of objectives of this type requires quantitative data on the performance of both unit or system and its sections or subsystems. Instrumentation for this category generally includes measuring basic inputs and outputs of the unit or system as well as basic inputs and outputs of its sections or subsystems. The overall performance levels of the sections or subsystems will then be analyzed for their contribution toward performance of the unit or system. This category will provide the most detailed information of any of these categories.

OBTAIN DATA (OBTN) denotes gathering engineering information which is to be measured to augment the general knowledge required in the development of the overall weapon system. This category may also be used for supplemental investigations such as environmental studies, ascertaining k factors, ground equipment studies, etc. The degree of instrumentation is not implied by this definition; individual objectives will indicate extent of instrumentation required.

ESTABLISH (ESTB) denotes gathering engineering information for the development of ground procedures and operating techniques. Objectives in this category are not necessarily dependent on analytic studies.

B. Test Block Numbers (Captive only)

Two columns of information are give under each run. These columns indicate which parameters are to be recorded on each test run. The first column gives the measurement priority. The second is used only for priority 1 measurements and gives the measurement category.

C. Priority Symbols (Captive only)

1. These measurements are necessary to ensure safe operation or satisfactory fulfillment of the test objectives. This includes functional readiness indications, the so-called "red line" indications. The test would be authorized to either "hold" or "abort" as applicable for any one of these measurements.

2. These are measurements secondary to any particular test objective. They will contribute additional information toward fulfillment of the test objective but the test would be authorized to "hold" only if the number and nature of the incomplete instrumentation in this category appeared detrimental to accomplishment of the test objective.

3. These are measurements of general information nature. They may supplement the priority 1 and 2 measurements, or they may be of environmental nature in and around the test stand. They will be taken only when manpower and schedules permit. No hold action will be authorized for any of these measurements.

Absence of a priority entry in the first column on any run indicates that the measurement will not be made on that run.

D. Measurement Categories (Captive only)

1A Operations Measurements - Those functions that have to be monitored before and/or during a test. Category "A" measurements will be indentified as such irrespective of whether the function has most significance before or during a test.

1B Post-Test Inspection Measurements - Those functions that are to be reviewed after a test to determine that systems operated properly and that the test was conducted safely.

SYSTEM EVALUATION MEASUREMENTS

A number of measurements are required for basic systems evaluation. Some of these are already included in categories 1A and 1B as defined above. The rest consist of all other priority 1 measurements.

E. Problem Area (Col. 75-79)

This system of coding is used to group related measurements for easier analysis. Descriptive heading of this coding appear in all tabulations that are presented in this order.

CONVAIR ASTRONAUTICS

UNCLASSIFIED

A

AC	Alternating Current
ACC	Acceleration
ACCEL	Accelerometer
ACTR	Actuator
ACUM	Accumulator
ACY	Accessory
ADAPT	Adapter
AGC	Automatic Gain Control
ALT	Alternate
AMB	Ambient
AMP	Amplifier
ANG	Angle
ANT	Antenna
APS	Accessory Power Supply
ASSY	Assembly
ATT	Attitude
AUD	Audio
AUX	Auxiliary
AVG	Average
AX	Axis
AZM	Azimuth

B

B	Booster
B1	Upper Booster
B2	Lower Booster
BAT	Battery
BCN	Beacon
BGG	Booster Gas Generator
BK	Break
BLKHD	Bulkhead
BLKHS	Blockhouse
BLWS	Bellows
BO	Boil Off
BRG	Bearing
BRKT	Bracket
B&S	Booster & Sustainer
BSTR	Booster
BTG	Beacon trigger Generator
BTL	Bottle
BYP	Bypass

C

C	Cycle
CALB	Calibrate
CAN	Canister
CATH	Cathode
CATHFOL	Cathode Follower
CCT	Circuit
CHNL	Channel
CHM	Chamber
CLS	Closed
CLOS	Closing
CLSD	Closed
CMPT	Composite
COF	Cut off
COMB	Combustion
COMP	Compartment
CONV	Converter
COR	Corner
CP	Contractors Panel
CTL	Control
CTR	Center
CYL	Cylinder

D

D	Decoder
DBR	Doubler
DC	Direct Current
DCDR	Decoder
DEFL	Deflection
DEFR	Deflector

DEL	Delivery
DEMOD	Demodulator
DESTR	Destructor
DETR	Detector
DI	Discrete Integrator
DIAM	Diametric
DIF	Difference
DIS	Discharge
DISC	Discrete
DISCH	Discharge
DISCON	Disconnect
DISPL	Displacement
DN	Down
DO	Drop Out
DP	Pressure Drop
DRVR	Driver
DSHE	Down Stream Heat Exchanger
DSTR	Down Stream
DT	Temperature Drop
DY	Delay

E

EMERG	Emergency
ENG	Engine
ENGAGMT	Engagement
ETO	Ethylene Oxide
ETP	Engine Test Panel
EVCO	Electronic Vibration Cutoff
EXT	External

F

FAIL	Failure
FB	Feedback
F & C	Fill & Check
F & D	Fill & Drain
FIN	Fine
FL	Flame
FLDN	Fielden
FLS	Flashing Light System
FOL	Follower
FR	Flow Rate
FREQ	Frequency
FRG	Fairing
FT	Flow Totalizer
FUL	Fuel
FV	Fuel Valve
FWD	Forward

G

GEN	Generator
GFST	Ground Fuel Start Tank
GFUT	Ground Fuel Ullage Tank
GG	Gas Generator
GLUT	Ground Liquid Oxygen Ullage Tank
GMBAL	Gimbal
GND	Ground
GN_2	Gaseous Nitrogen
GOUT	Ground Liquid Oxygen Ullage Tank
GOX	Gaseous Oxygen
GMP	Gallons Per Minute
GRND	Ground
GU	Ground Unit

H

HD	Holddown
HE	Helium

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HI	High	LNG	Long
HLDR	Holder	LN_2	Liquid Nitrogen
HORZ	Horizontal	LO	Low
HPD	Hydraulic Pump Discharge	LOKIN	Lockin
HPP	Hy Pneu Panel	LOKUP	Lockup
HSP	Helium Storage Panel	LONG	Longitudinal
HSV	Head Suppression Valve	LO_2	Liquid Oxygen
HT	Heat	LT	Light
HTR	Heater	LUB	Lube
HYD	Hydraulic	LVL	Level
	I		**M**
IF	Intermediate Frequency	M	Minus
IGN	Ignitor or Ignition	MAG	Magnetron
IN	Inlet	MAN	Manifold
INFO	Information	MANR	Manometer
INJ	Injector or Injection	MC	Megacycles
INST	Instrumentation	MK	Mark
INTERR	Interrogation	MNL	Manual
INTG	Integrating	MOT	Motor
INTGD	Integrated	MPP	Missile Power Control Panel
INTL	Internal		
INVR	Inverter	MSG	Message
		MSL	Missile
	J	MSW	Microswitch
		MTL	Metal
JET	Jettison	MULT	Multiplier
JUNCT	Junction		
			N
	K		
		NAA	North American Aviation
	L		
		N/C	Nose cone
L	Launcher		
L/LFM	Landline FM		**O**
LIM	Limiter		
LN	Line	OP	Operational, Optical Probe, Output

[redacted]

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OPG	Opening	PUSV	Propellant Utilization Servo Valve
OPN	Open		
OPT	Output	PUV	Propellant Utilization Valve
ORFC	Orifice		
OSC	Oscillator	PV	Propellant Valves
OTBD	Outboard	PWR	Power
OTP	Output	PWRSUP	Power Supply
OUT	Outlet		
OVBD	Overboard		**Q**
	P	Q	Quadrant
P	Pressure		**R**
PB	Pulse Beacon		
PB-IP	Pulse Beacon-Impact Predictor	R	Rate Beacon
		RAD	Radial
PCH	Pitch	RB	Rate Beacon
PCP	Preasurization Control Panel	RB-IP	Rate Beacon-Impact Predictor
PH	Phase	RCC	Rough Combustion Cut-off
PLT	Plate		
PMP	Pump	RCVR	Receiver
PNEU	Pneumatic	RD	Rocketdyne
POS	Position or Positioner	RDY	Ready
PPS	Pulses Per Second	RECIRC	Recirculate
PR	Phase Reversing	REDNDT	Redundant
PREP	Preparation	REF	Reference
PRES	Pressurizing	REFER	Reference
PRESD	Pressurized	REG	Regulator
PRESS	Pressurization	REGS	Regulators
PREVLV	Prevalve	REL	Relay
PRF	Pulse Repetition Rate	RES	Reservoir
PRG	Purge	RET	Return
PRGR	Programmer	RETR	Retract
PROP	Propellant	RF	Radio Frequency
PS	Pounds Per Second	RG	Rate Gyro
PSUP	Power Supply	RLF	Relief
PU	Propellant Utilization	RLS	Release

UNCLASSIFIED

RNG	Range	SURF	Surface
ROL	Roll	SUS	Sustainer
RSB	Range Safety Beacon	SV	Servovalve
RSC	Range Safety Command	SW	Switch
		SYS	System
	S		T
S	Sustainer		
SA	Servo Amplifier	TACH	Tachometer
SAD	Saddle	TANG	Tangential
SAT	Satisfactory	TAR	Target
SC	Subcarrier	TBN	Turbine
SDC	Secondary Distribution Center	T/C	Thermocouple
		TCC	Test Conductor's Console
SECT	Section		
SEL	Selector	TEMP	Temperature
SEP	Separation	TH	Thrust
SEQ	Sequence	THST	Thrust
SFC	Surface	TK	Tank
SFTY	Safety	TM	Telemeter
SGG	Sustainer Gas Generator	TMR	Timer
SHLD	Shield	TOT	Total
SIG	Signal	TRIG	Trigger
SNERS	Sensors	TSYS	Transfer System
SNSR	Sensor	TU	Transfer Unit
SOL	Solenoid		
ST	Static		U
ST	Start Tank		
STA	Station	U	Upper
STAB	Stabilizer	UMBIL	Umbilical
STGTH	Strength	UNREG	Unregulated
STP	Stop	USHE	Upstream Heat Exchanger
STR	Start		
STRT	Start		
STRUC	Structure		V
SUP	Supply		
SUPP	Suppression	VDC	Volts Direct Current
SUPT	Support	V1	Left Vernier
SUR	Surface	V2	Right Vernier

VEL	Velocity
VERN	Vernier
VERT	Vertical
VIBN	Vibration
VLV	Valve
	W
WT	Weight
	X
X	Trans
XCHANGER	Exchanger
XCIT	Excitation
XDCR	Transducer
XDCRSUP	Transducer Supply
XDUCR	Transducer
XGR	Exchanger
XMTR	Transmitter
XPL	Explosive
XPNDR	Transponder
XST	Exhaust
XTAL	Crystal
XVERS	Transverse
XVTR	Transverter
	Y
YRL	Yaw Roll
	Z

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